U. S. DEPARTMENT OF AGRICULTURE

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A. C. TRUE, DIRECTOR

EXPERIMENT STATION RECORD

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U. S. DEPARTMENT OF AGRICULTURE
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Meetings of agricultural workers to consider matters relating to their special fields or to their regions have become more common, and such group gatherings will quite likely form an increasingly important feature. They are an expression of the common bond of interest, and of the advantage of a closer association and more intimate understanding of one another's work than can be maintained otherwise. Often they furnish almost the only means of developing and harmonizing methods of procedure and bringing about a closer union of effort.

In the Southern States an Association of Southern Agricultural Workers has been in existence for many years, and has had considerable influence on the development of agricultural work and legislation. Starting as an organization of state departments of agriculture, it has steadily expanded until it includes the various groups of workers in the agricultural colleges, and especially such as have to do with experimentation and the effective dissemination of its results.

This association held its seventeenth annual convention at the University of Tennessee, in the middle of November. The program covered two days, for a part of which the convention broke up into sections for agronomy and live stock. The attendance was a representative one, and a very live interest was manifested throughout the meeting in the various topics under discussion. A part of one afternoon was spent in going over the interesting plat and field work of the experiment station, which gave opportunity for discussion of methods and results; and an evening was occupied with an exhibition of live stock of the university and station, illustrating the purpose and some of the results of the breeding work with horses, mules, and cattle.

The meeting was not only an enjoyable one for those in attendance, bringing them into closer fellowship, but was felt to be a highly profitable one from the standpoint of the various types of work represented. The enthusiasm developed settled the question which had arisen as to the advisability of continuing the association. The useful place it has occupied in the past was acknowledged, and it was urged that it should be broadened rather than discontinued, addressing

itself to the special problems of the region without in any way duplicating or detracting from the efforts of the national Association of American Agricultural Colleges and Experiment Stations. The next meeting is to be held at New Orleans in January, 1917. The president for the coming year is Dr. W. M. Riggs, of South Carolina, and the secretary, Prof. D. T. Gray, of the North Carolina Department of Agriculture.

The keynote of the convention was the more effective coordination of experiment station work, a subject which, although considered in its local application, is of much broader interest. It was a feature of the address of the president, Prof. B. W. Kilgore, was the subject of a paper by the Chief of this Office and of a report by a special committee, and was discussed at considerable length. In the end it was endorsed by the association as one of its special aims, and two committees were appointed to promote the plan and report at the next convention.

In his presidential address Professor Kilgore made a strong plea for a larger measure of cooperation among station workers—a coming together in an effort to bring about a greater degree of uniformity in the planning and conduct of their work. This was deemed especially important in the case of groups of States having similar agricultural conditions. "Individual effort and individual leadership are not to be discouraged or discounted," he said, "but unity of plans or efforts are not to be ignored if we are to accomplish our task in the best way." He explained that heretofore practically all of the work in agronomy, for example, has been planned and conducted independently and with special reference to the State in which it was carried on, although the results are capable of and are often given a wider application. "There has been much duplication of work in this way, and in addition there has been so little uniformity in the plans and methods that the results have not been comparable, so that we might have the benefit of bringing the experience of all to bear upon the particular problems under investigation."

Continuing to use the subject of agronomy to illustrate his idea, Professor Kilgore said: "Our crops, soils, and climate are near enough alike for us to make a serious effort to get our workers in agronomy together, with a view of working out uniform plans and methods for the conduct of the work, so that their results when obtained may be comparable and so that unnecessary duplication may be prevented. This would not necessarily interfere with individual effort, but might be so worked out that men and institutions especially qualified and equipped for particular lines of work might devote themselves especially to these things, leaving other things

for other men and institutions to develop, instead of dividing their efforts and resources between too many subjects."

Such a view of the desirability of coordination and cooperation in agricultural investigation is not new, although it has not been very much in evidence. It was one of the topics taken up at the first convention of the Association of American Agricultural Colleges and Experiment Stations, in 1887. A committee appointed to report upon its feasibility pointed out some of the difficulties at that early stage, growing out of the immature plans of the stations and the lack of leadership. But the committee suggested that the stations which were planning to work in a given subject, as dairying for example, should consult together and seek the counsel of specialists. And it pointed to the opportunity which field experiments offer for stations to work under a uniform or harmonious plan.

At a later meeting of the association, held in Knoxville in 1889, the desirability of making up circles or sections comprising stations interested in common lines was set forth, as a means of unifying the work. At that meeting a committee further emphasized the advantages of cooperation, pointing out the great opportunity for united or coordinated effort, and very properly suggesting that it be voluntary between States having common interests and conditions.

From time to time cooperative efforts of limited scope have been arranged, but in spite of the theoretical advantages of some degree of coordination, if it could be accomplished, the inherent difficulties of such an undertaking, accentuated by a marked feeling of individuality and separateness with respect to their work, has resulted in the stations conducting their efforts mainly on an independent basis. This is true despite great similarity in conditions and problems, and a common purpose as public institutions. While there has been exchange of views and discussion of methods of experimentation, as far as the conduct or the unifying of such work is concerned there has been nearly or quite as much independence as between the unaffiliated research institutions of the country.

The question naturally arises after more than a quarter of a century of such independent activity as to whether the apparent advantage of a closer coordination is a theoretical and imaginary one, or whether it has actual possibilities.

It is admitted that in the simpler forms of experimental work there has been much duplication and repetition, considerable of it beyond doubt unnecessary and without material advantage to the progress of the inquiries themselves. It can scarcely be doubted that there has been considerable lost motion and wasted energy, except that it has helped to train experimenters and to provide local demonstrations. It has been frequently contended in the past that to carry

conviction locally the facts must be presented through experiments by the local station, and this has been the excuse for a kind of experimental work which in reality lies in the field of demonstration. Experiments which merely demonstrate locally facts already developed, without adding anything to the understanding of the factors that limit or affect them, aim to teach and are now in the province of the extension service rather than of the experiment station.

In the past there has been no comprehensive general plan beyond the individual stations. As a result they have not supplemented each other in their work and extended their findings in the most effective way. Because the work has been so independent and individualistic, it has frequently not connected up in a way to fully cover the ground or be entirely conclusive as far as it went. Sometimes it has not seemed to take full account of the work and the results elsewhere. This is apparent to any one who examines the combined product of the past, or attempts to summarize or digest it. As time goes on the weak spots are strengthened and the omissions filled in, but in the meantime it remains patchy.

The extent to which unwarranted duplication and repetition are carried on has been a frequent subject of criticism of our stations, and has sometimes led outsiders to infer that the proportion of new or original work was relatively small. The necessity for repetition, especially under a sufficient variety of conditions, is not to be questioned, but at the present stage its defense lies in a well-directed attempt to verify doubtful points or add to the information. The economic results will hardly be twice the same in the same locality, because the economic relations are subject to constant change; and strictly local features and conditions will often affect the general results of other classes of experiments to a considerable degree. These facts impose a practical limitation on the extent to which repetition to ascertain within narrow limits the local or current application of an experiment is feasible.

Manifestly every new experiment ought to be undertaken with full knowledge of the status of the subject, and so planned as to form a definite contribution as far as it goes. In order that it may add its mite to the sum of definite information, it should be conducted, as Director Kilgore has stated, on a basis which will make the results comparable with those of other workers. This is especially true, of course, of the more elementary experiments. These should be on a basis or plan that will enable direct comparison and summation. Then new experiments will at least mean additional evidence which can be applied in strengthening the suggestions or conclusions from previous experiments. But where the work is done from a too local standpoint new factors are often introduced or limiting ones left unchecked which in the end make the experiment stand practically

by itself. It may even add confusion, rather than shedding a clearer light or a deeper understanding.

The individual worker and the individual station can contribute to the sum of definite information and general understanding in proportion as their work is sound and is so planned that it can be correlated and compared and fitted in with the work of others. Alone it is rarely complete and final. The accumulation of data, as an end in itself, is of little general value unless the data are secured under conditions which make them comparable with other data and observations. It is for this reason that much attention is given to uniform methods of analysis and accepted details of technique.

As to the opportunity for a greater degree of cooperation and coordination in agricultural experimentation, the similarity of the subjects requiring investigation and experiment in the different natural regions leaves little ground for question. This opportunity is reinforced by an examination of the programs under which the various stations are working. Many problems are, of course, so fundamental in their nature that the results apply to the whole country. Others, however, embody more strictly local or regional aspects. They do not stop at state boundaries, and the State is not the most effective unit in working them out. Frequently they are being worked upon by a considerable number of stations quite independently and without knowledge of one another's activities until after publication.

There has often been a feeling that a station's efforts should not be too restricted but should cover the main lines and leading problems in its State. This is doubtless in part responsible for a similarity of the questions studied in States having much in common. With a greater uniformity in planning the danger of unprofitable duplication would be lessened, and the combined effort would go farther in advancing the subject.

This is primarily what the association had in mind and is aiming to bring about. A committee from the live stock section presented a report which dealt specifically with the subject of feeding. The report contained some pertinent and helpful suggestions as to the organization of feeding experiments, and the method of conducting and reporting them. It suggested also a coordination of the work in that line, with a possible division of the field or of topics to be studied. In order to make the results of feeding studies more applicable to given regions, it was suggested that the Southern States be divided into four natural groups, the work in each to be planned especially with reference to that group of States.

The discussion at the Knoxville meeting evidently had the experimental work especially in mind, rather than the advanced types of

investigation in which the qualities supplied by the individual constitute a large element in success. We recognize effective original research as essentially an individual product. But in this field also, there is probably opportunity at times for a coordination or division of effort which would conserve time and employ the various participants to the best advantage, so that the work of each would be productive and would avoid unprofitable duplication.

In general science, men of special originality and genius have developed new lines of thought or made epoch-making discoveries in moments of inspiration or by close, concentrated study. Similarily in agricultural investigation, the product of certain men stands out in a way that has stamped them as leaders of thought. There are others apparently of less originality but of painstaking industry whose efforts have contributed to the advancement of research by exact observations and careful records, following along lines suggested by the theories of others. Their work supplements and confirms or tests the generalizations or theories which have been put forward, and it extends the basis for exact knowledge or its application. Their most useful work is often in this field, at least until they have developed a theory or point of attack which justifies embarking on a new and independent line of investigation.

If some feasible means could be provided for more effective coordination in research, or some way by which through mutual agreement certain phases of a subject could be divided and portions undertaken by groups of investigators working under a common understanding, we should make progress more rapidly, for the promise of well rounded and connected investigation would be increased. There would be less likelihood of working at cross-purposes, or of efforts which in the end prove ineffective and largely negative.

A recent writer in *Nature*, discussing the desirability of cooperation in research, comments on the disconnected character of the published accounts of scientific work. He says: "The proceedings of our learned societies, from the Royal Society downward, and of the technical institutions as well, are a record of an ever-increasing number of papers on subjects for the time being attracting attention, but which are quite detached in their manner of dealing with it. . . . Certain discoveries and papers stand out as landmarks, and epoch-making. On the other hand, it is impossible to avoid asking the question whether much of the work of those who may perhaps be described as the privates and officers of lower rank in the scientific army could not have been made to yield more valuable results if it had been better coordinated and directed."

The article suggests that the learned societies might contribute to the efficiency of investigation by helping to direct individual workers to lines of investigation converging in certain useful directions or

around certain topics. "Valuable work might be done by the formation in these societies of committees of investigation, composed of small groups of members or fellows charged with the special duty of following out some particular line of experimental or theoretical work, and publishing the result as the joint work of the committee and not of individual members of it. Such committees have often been formed and done much valuable work." The writer admits that "no doubt such cooperative work requires an amount of self-suppression which is not widely distributed," but he adds that organization is necessary in most important undertakings, and that all team work has the advancement of the common end in mind rather than the individual.

To be effective and lasting, collaboration or coordination of work must, of course, be voluntary with the institutions. Each collaborator needs to be a real integral part of the joint undertaking, and to have a degree of responsibility and of latitude which will stimulate him to make his part a constructive effort. By relating the workers having an interest in a common problem, it should be possible to stimulate the spirit of inquiry and to make investigation more effective. There is a certain zeal which arises from such co-partnership or association, and a responsibility which the relation suggests.

The step taken by the Southern Agricultural Workers is a more definite one in this direction than any previous movement. The association was clear in its conviction that such an end was highly desirable, and expressed confidence in its feasibility. It adopted a resolution directing that "committees be appointed to correlate and coordinate the work of the experiment stations with the purpose of preventing unnecessary duplication and expenditure," suggesting that to the former committee on live stock experiments one be added for agronomy. These committees were appointed, and upon them will devolve the responsibility of carrying forward the idea.

It is realized that it is not feasible or advisable to attempt to standardize investigation, and that we can ill afford to make our experimental work stereotyped. Neither would it be wise to subordinate a majority of the investigators in a manner to suppress their initiative or make them routine factors under a large directing organization. This is not the purpose, and is not believed to be inherent in the plan.

There is every encouragement at this time to develop plans which will give permanent additions to the common store of knowledge, and as large a degree of finality in the results as it is feasible to attain. The necessity for haste in agricultural investigation is not as great as would sometimes appear from the cross-cut methods which have been followed. The stations may fairly be recognized as permanent

institutions. They exist not alone for their respective States but in the aggregate for the country as a whole and for the science of agriculture.

Deliberate planning, with full knowledge of what other workers have done and have under way, is time saved in the end. The analysis of such plans and methods and constructive criticism by competent committees might do much to strengthen the attack and make the work more effective. And the mature suggestions of a committee for working together on common problems, or harmonizing the independent efforts of the stations of a region, can hardly fail to be helpful and to command attention.

It will be a matter of much interest and gratification to all friends of the agricultural experiment stations to know that the memory of the late William H. Hatch has been honored by the erection of a stately monument in his home city. Although a testimonial to the affection and appreciation of his townsmen and friends, it has more than a local significance, for it perpetuates the memory of one who was long a national figure, and who occupies a high place in the history of agricultural advancement.

The monument consists of a stone pedestal surmounted by a large bronze figure of Colonel Hatch. It stands in Central Park at Hannibal, Missouri, where he had resided for fifty years. It was erected through the efforts of a memorial association in the fall of 1914, but it became necessary to delay its dedication until the past fall. The dedication exercises were held October 26, 1915, with addresses by speakers prominent in local and political life.

Colonel Hatch died December 23, 1896. He did not live to see the great work set in motion by the act which bears his name come into full fruition, but he saw something of the realization of its possibilities, and he took much pride and satisfaction in the national development of the experiment station idea. No man could wish a more noble or enduring monument than that which links his name with the establishment of the American system of experiment stations, represented in every State by a permanent institution. There has been no more significant and far-reaching step for the advancement of American agriculture in any time. There have been other great measures, before and since the "Hatch Act," but because it brought the previous ones into fulfillment and laid the foundation which made succeeding ones a natural sequence, the measure stands out conspicuous as an epoch-making one in American agriculture.

If Colonel Hatch builded better than he knew it is because the developments with and out of the experiment stations already have surpassed the vision of the men of his day. His name will be remembered with great honor as one who saw the significance of an experiment station system and made possible its attainment.

RECENT WORK IN AGRICULTURAL SCIENCE.

AGRICULTURAL CHEMISTRY—AGROTECHNY.

The production of sulphuric acid and a proposed new method of manufacture, W. H. WAGGAMAN (*U. S. Dept. Agr. Bul. 283* (*1915*), *pp. 39, fig. 1*).—The first pages of this bulletin deal with a general consideration of the manufacture of sulphuric acid, statistical data and discussions of the principles of the two general methods of manufacture—the contact process and the lead-chamber process—being given. A critical discussion is given of a number of modifications of the chamber process which have been employed more or less successfully to secure a thorough mixing of the gases involved in the reaction and for controlling their temperature, these two conditions being essential for the efficient operation of a plant.

The author describes a new modification of the chamber process for the manufacture of sulphuric acid. This modified method is designed to secure a complete mixture of the gases and control of the temperature without the use of excessive and complicated apparatus. It is stated that while the method has been tried out only in the laboratory, the results obtained indicate that it would probably be successful if worked on a factory scale.

"This method is based on the fact that if a mixture of warm gases is drawn downward through a special flue their resistance to the downward pull, together with the constant change of their course, will tend to mix them very intimately, and unless the internal diameter of the flue is too great there will be practically no zones of inactivity in the apparatus. Moreover, the constant impinging of the gases on the walls of the spiral flue, which can be cooled either by air or water, makes it practicable to maintain the gases at a temperature most favorable for the efficient yield of sulphuric acid."

The process was carried out in the laboratory as follows: The air, steam, sulphur dioxid, and oxids of nitrogen were given a preliminary mixing by being passed through a 200 cc. test tube containing a small amount of water heated to boiling. The mixed gases were then drawn into the lead spiral, which takes the place of the lead chambers in the process as ordinarly carried out. Most of the sulphuric acid produced in the system was formed in the lead coil, which was heated to about 90° C. The residual gases were then passed through absorption bulbs containing strong nitric acid to absorb the sulphur dioxid which had escaped oxidation in the spiral. Full data are given regarding the quantities of sulphuric acid produced in these laboratory experiments.

In considering the construction of a sulphuric-acid plant based on the apparatus described, the author states that the lead spiral is intended to replace only the lead chambers and intermediate towers and is not intended to replace the Glover or Gay-Lussac towers. Application has been made for a public-service patent covering the process.

The appendix of the publication contains a classification of brief abstracts of American patents on the manufacture of sulphuric acid.

Hardened oils, E. MELLANA (*Ann. Chim. Appl.* [*Rome*], *1* (*1914*), *No. 9–10, pp. 381–387*).—Cotton seed, soy bean, kapok seed, whale, and sperm oils were hydrogenated, nickel being used as the catalyst, and the properties of the re-

sulting products were compared with those of the original oils. The hydrogenated oils gave the respective color reactions for marine animal and seed oils, although Halphen's and Milleau's reactions for cotton-seed and kapok-seed oils in the hardened fats made therefrom gave negative results. Nickel was present in all of the products.

The catalytic reduction of oleic acid and cotton-seed oil by means of hydrogen in presence of finely divided nickel, T. W. A. Shaw (*Jour. Soc. Chem. Indus., 33 (1914), No. 15, pp. 771–774, figs. 2*).—A digest of the data obtained by hydrogenating oleic acid and cotton-seed oil at diminished and increased pressures.

A new and improved form of Kjeldahl distillation apparatus, A. D. Holmes (*Jour. Indus. and Engin. Chem., 6 (1914), No. 12, pp. 1010–1012, figs. 3; 7 (1915), No. 8, pp. 693, 694, fig. 1*).—A description of an apparatus and a modification thereof with which it is possible to make ten or more distillations at one time. The condensers are so arranged that each one is entirely separate and may be removed without disturbing the operation of the others. All gas and water taps are also separate. The modified apparatus, which can be set up on a laboratory table of the usual height and still not be too high to be used by a person of small stature, is shown in figure 1, together with a horizontal offset burner which may be used in connection with it.

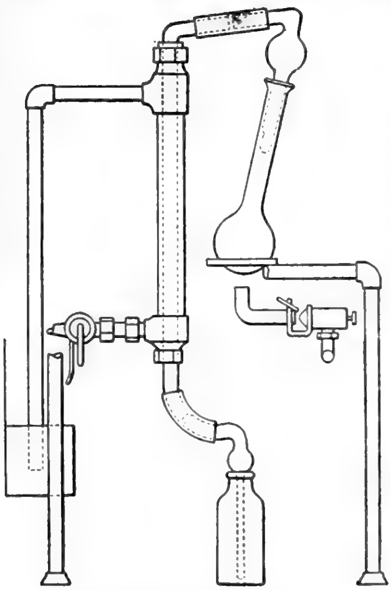

Fig. 1.—Improved form of Kjeldahl apparatus, with offset burner.

Notes on the colorimetric determination of phosphorus in soil extracts, C. E. Millar and F. A. Gangler (*Jour. Indus. and Engin. Chem., 7 (1915), No. 7, p. 619*).—From the results obtained with the Veitch method (E. S. R., 14, p. 833), as perfected by Schreiner and Brown (E. S. R., 16, p. 533), "it would appear that if sufficient care is given to the purity of reagents and to the measuring out of all reagents, determinations of small amounts of phosphorus may be made in soil extracts with considerable accuracy."

The determination of sulphates in soils, P. E. Brown and E. H. Kellogg (*Jour. Indus. and Engin. Chem., 7 (1915), No. 8, pp. 686, 687*).—The method described in this article is also fully explained in Research Bulletin 18 of the Iowa Experiment Station, noted on page 19 of this issue.

A method for the titrametric estimation of phytin, W. Heubner and H. Stadler (*Biochem. Ztschr., 64 (1914), No. 4–6, pp. 422–432*).—Phytic acid in 100 cc. of a solution of 0.6 per cent hydrochloric acid can be determined with a 0.05 to 0.2 per cent ferric chlorid solution which also contains an equivalent amount of 0.6 per cent hydrochloric acid, employing 0.03 per cent ammonium sulphocyanid solution as an indicator. Each milligram of iron is equivalent to 1.19 mg. of phytin phosphorus. Titrations can be made in the presence of inorganic phosphoric acid or phosphoric acid esters, since these are not precipitated by iron in an acid solution, provided they are not in a great excess over phytin.

Estimation of aldoses.—I, The action of neutral sodium hypo-iodite, N. Bland and L. L. Lloyd (*Jour. Soc. Chem. Indus., 33 (1914), No. 19, pp. 948, 949*).—The action of sodium hypo-iodite upon formaldehyde was first studied. It was found satisfactory for estimating formaldehyde but not for paraformaldehyde. The sugars studied were dextrose, levulose, sucrose, lactose, and maltose. Only sugars containing an aldehyde group reacted with neutral hypo-iodite. The results for dextrose varied from 96.4 to 99.7 per cent, average 98.8; for lactose, 99.1 to 99.4, average 99.3; and maltose 99.9 to 101.8, average 100.2. Sucrose (pure and chemically pure) when hydrolyzed gave a higher result, increasing with the purity of the sucrose.

Attempts are being made to apply the methods to the examination of starch and dextrin products employed for sizing purposes.

The production of ω-hydroxy-σ-methylfurfuraldehyde from carbohydrates and its influence on the estimation of pentosans and methylpentosans, Mary Cunningham and C. Dorée (*Biochem. Jour., 8 (1914), No. 4, pp. 438–447*).—"ω-Hydroxymethylfurfuraldehyde is formed by the action of dilute hydrochloric acid on hexoses, starch, and the celluloses. Its amount varies from one to two per cent. Owing to its slow formation, it does not interfere with the accuracy of pentosan estimations made by the Kröber phloroglucinol method, if aniline acetate is used as the indicator. Its occurrence, however, renders previously made estimations of methylpentosan of doubtful value. It is probably the unknown substance giving a precipitate with phloroglucinol referred to by previous workers, and its presence explains many of their observations."

Determination of rhamnose in the presence of other methylpentoses, E. Votoček and R. Potměšil (*Bul. Soc. Chim. France, 4. ser., 15–16 (1914), No. 13, pp. 634–639*).—Rhamnose is converted into cyanhydrin by hydrocyanic acid, and cyanhydrin when hydrolyzed yields δ-rhamno-hexonic acid, which is oxidized with heat by nitric acid to mucic acid. On completion of oxidation the solution is evaporated to one-third of its volume on a water bath and allowed to stand for three days in the cold, the sides of the container being rubbed with a glass rod at intervals. The crystalline mucic acid obtained is washed with a little water, dried, and weighed, 45.5 parts of mucic acid representing 100 parts of anhydrous rhamnose. When other methylpentoses are present, for instance rhodeose, the mucic acid yielded is not so constant, but the method for this purpose is considered satisfactory enough to estimate the molecular proportion of rhamnose present in hydrolyzable glucosids.

On the determination of small quantities of hydrocyanic acid, A. Viehoever and C. O. Johns (*Jour. Amer. Chem. Soc., 37 (1915), No. 3, pp. 601–607*).—In some work on cyanogenetic plants it was found necessary to have a method for estimating small quantities of hydrocyanic acid. The Prussian blue method, when modified, was found to meet the demands of the work when certain precautions are taken.

"Before concentrating the hydrocyanic acid solution, as in the case of a distillate, the portion to be tested should contain a slight excess of free sodium hydroxid. We used 0.02 to 0.1 gm. This solution is then concentrated in a round-bottom flask of 200 cc. capacity by using a vacuum pump and condenser. The heat is supplied by immersing the flask in a water bath kept below 70°. To avoid any loss by spattering the flask is fitted to the condenser by means of an adapter such as is used in the Kjeldahl method for the determination of nitrogen. We concentrate until less than 1 cc. of liquid remains in the flask.

"From 0.2 to 0.5 cc. of 3 per cent freshly prepared ferrous sulphate solution and about 0.05 gm. of potassium fluorid are then added. The flask is exhausted at once by means of a water vacuum pump. The contents are mixed by rotating

the flask. After five to ten minutes the flask is detached from the pump and the mixture acidified with 30 per cent nitric acid. The blue color appears at once. Where only traces of hydrocyanic acid are present it is sometimes necessary to warm to about 50° in a water bath before the color appears. The suspension is then diluted to a volume that would give a color density convenient to compare with a suspension of Prussian blue made from a known weight of potassium cyanid.

"As a standard we used a suspension of Prussian blue made from 1 mg. of potassium cyanid. Such a suspension diluted to 25 cc. gave a color of convenient density. For comparison we used a Duboscq colorimeter.

"If the cyanid solution to be tested was sufficiently concentrated so that further evaporation was unnecessary, the test could be made in a test tube. We kept the air out by means of a stopper and rotated the tube only enough to mix the reagents, allowing the mixture to stand five to ten minutes before acidifying. Much shaking must be avoided to prevent excessive oxidation of the ferrous hydroxid. . . .

"The maximum quantity of Prussian blue can be obtained from a cyanid only when the volume of the solution to be tested is sufficiently small, as has been indicated by Berl and Delpy and by Lander and Walden. In the test for a cyanid it is better to acidify with nitric or sulphuric acid than with hydrochloric, since an excess of the latter tends to produce a green color. Any considerable excess of ferric salts should be avoided in testing for a cyanid. Application of heat is not necessary in testing for a cyanid by the method described. The presence of certain salts, particularly potassium fluorid, in the liquid to be tested, has proved to be of great advantage. The method furnishes a very delicate qualitative test for the presence of a cyanid. The method is suitable for the estimation of very small quantities of a cyanid in distillates. The test as described herein can be applied microchemically to sections of cyanogenetic plants."

Examination of tomato pulp, W. D. BIGELOW and F. F. FITZGERALD (*Jour. Indus. and Engin. Chem., 7 (1915), No. 7, pp. 602–606*).—Tomato pulp is prepared in large quantities for the manufacture of ketchup and pulp. While the greater part of the pulp placed on the market is made from whole tomatoes, there are a number of plants that manufacture pulp from trimming stock in connection with the canning of tomatoes; it accordingly becomes important to be able to distinguish the two kinds of pulp by a laboratory examination. As the result of this investigation a basis was found whereby differentiation could be accomplished.

If the specific gravity or index of refraction of the filtrate prepared from the pulp of unknown origin and the percentage of solids in the pulp by drying do not agree with the relation between the determinations given in a table included in the text, it may be assumed that the sample under examination was not prepared from whole tomatoes, or that some other substance, such as salt, has been added. Moreover, trimming stock pulp rarely conforms to the relations found in whole tomato pulp. For instance, the insoluble solids are usually higher and the acid lower.

A description of the method used in the investigation is given.

The judging of milk, C. J. KONING and W. C. MOOIJ, JR. (*Chem. Weekbl., 11 (1914), No. 24, pp. 518–550, figs. 4*).—This discusses the variations in the milk constituents and physical characteristics as influenced by temperature, removal of the animal from the barn or pasture, change of feed, individual peculiarities, estrum, milking personnel, thoroughness of milking, diseases, calving, insufficient drinking water, time of taking water, flies, and unknown causes. It also demonstrates the value of certain tests (fat, specific gravity, total solids,

fat-free dry substance, polarization, sediment, acidity, freezing point, chlorin, chlorid of calcium serum refraction, and nitrates) for determining the quality of milk.

The differentiation of animal from plant fats, with special reference to Welman's reaction and the utility of Welman's reagent for differentiating butter and margarin, BIERMANN (*Ztschr. Veterinärk., 26 (1914), No. 4, pp. 168–170*).—Welman's test is not deemed satisfactory for distinguishing animal from plant fats. It can, however, be used for detecting margarin in butter. The method is much easier to conduct than the furfural or Reichert-Meissl tests.

Estimation of saccharose in frozen and thawed beets, É. SAILLARD (*Compt. Rend. Acad. Sci. [Paris], 160 (1915), No. 12, pp. 361–363; Jour. Agr. Prat., n. ser., 28 (1915), No. 38, pp. 266–268*).—Beets which were frozen were found to contain one or more substances which could be hydrolyzed with hydrochloric acid at 69° C., but not with invertase at 50 to 55°.

The comparative study of different methods of inversion (Clerget, Herzfeld, modified Herzfeld, Andrlik, Pellet, Saillard, and Ogilvie), M. A. GILLET (*Bul. Assoc. Chim. Sucr. et Distill., 31 (1914), No. 12, pp. 992–1004*).—It was found that direct alkaline polarization by the Clerget and Herzfeld methods and acid inversion polarization do not give accurate results. This is due to the interference of optically active substances which in all probability are amino acids. Acid direct polarization employing hydrochloric acid and urea will give accurate results with beet molasses, but the method is not deemed practical because it necessitates rapid working in order to prevent inversion of sucrose by the acid. Sulphurous acid, when employed according to the method suggested by Pellet and Ogilvie in 1912, will give identical results and with less trouble. The neutral double polarization proposed by Saillard is satisfactory but is difficult to conduct, and can not, therefore, be used in routine factory work. The invertase method of Ogilvie gives results which agree closely with those yielded with the Pellet and Andrlik modifications. The most accurate and practical method is deemed the Pellet procedure, which uses sulphurous acid in excess in making the direct polarization.

Reduction of copper oxid in alcohol vapor in reducing sugar determinations and copper analysis, A. WEDDERBURN (*Jour. Indus. and Engin. Chem., 7 (1915), No. 7, pp. 610, 611*).—The precipitate of suboxid of copper is collected in an alundum filtering crucible, using Spencer's filtering funnel with suction and washing with hot water and alcohol. The crucible is then heated to redness to burn off organic matter, cooled until the redness just begins to disappear, and immersed in an atmosphere of alcohol vapor. The reduction to metallic copper is said to be almost instantaneous and complete, and the results obtained are identical with those by reduction in hydrogen, closely approximating the electrolytic method.

Ether-soluble matter in the nitrogen-free extract of feedstuffs, J. B. RATHER (*Jour. Indus. and Engin. Chem., 7 (1915), No. 7, pp. 613–615*).—Previously noted from another source (E. S. R., 32, p. 709).

The determination of lint in cotton-seed meal, R. N. BRACKETT (*Jour. Indus. and Engin. Chem., 7 (1915), No. 7, pp. 611, 612*).—The determination of lint in cotton-seed meal has been found impracticable by the methods heretofore proposed. What appeared to be a better procedure consists in dissolving the lint in zinc chlorid solution.

METEOROLOGY.

Text-book of meteorology, J. VON HANN and R. SÜRING (*Lehrbuch der Meteorologie. Leipsic: C. H. Tauchnitz, 1915, 3. rev. ed., pp. XIV+847, pls. 28, figs. 108*).—In this edition the plan followed in one of the earlier editions of

giving copious references to literature and full reviews of investigations has been adhered to. A very thorough revision bringing the book well up to date has been made, the associate author assisting in the work of general correction and contributing new chapters relating to temperature of the upper air, aerology, cloud forms, and atmospheric electricity.

The practical utility of a world bureau of meteorology, W. M. Hays and H. H. Clayton (*Symons' Met. Mag., 49 (1914), No. 586, pp. 176–178*).—The advantages of such a bureau are set forth. The first of these is "to increase materially the value of the crop estimates of each country, and also of the world area estimates by taking account of the influences of meteorological happenings as soon after their occurrences as possible. The second is to unify and greatly improve the meteorological service of each country and of the entire world."

Climatic subdivisions of the United States, R. DeC. Ward (*Bul. Amer. Georg. Soc., 47 (1915), No. 9, pp. 672–680, figs. 5*).—Various schemes of subdivision which have been proposed by others are noted and the essentials of such a scheme are defined. It is stated that climatic variations in the United States are meridional rather than latitudinal. It is held that the subdivisions adopted by the Weather Bureau of the U. S. Department of Agriculture in its publications should be used unless there is some very good reason to the contrary.

Three great natural topographical and climatic subdivisions of the United States are defined as follows: "(1) The eastern, embracing about one-half of the whole area, extending from east of the Rocky Mountains to the Atlantic Ocean and Gulf of Mexico; (2) the western mountain and plateau district; and (3) the narrow Pacific slope." Five climatic subdivisions are described as follows: Eastern, Gulf, Plains, Plateau, and Pacific.

Seasonal limits, F. J. Brodie (*Symons' Met. Mag., 49 (1914), No. 586, pp. 182, 183*).—The author maintains that the present designation of the seasons as comprising groups of seasons of three months each is unsatisfactory, and recommends as a substitute therefor "periods bounded by weeks, assigning, moreover, a longer period to the summer and winter than to the spring and autumn."

On the occurrence of lunar periods in solar activity and the climate of the earth, O. Pettersson (*Svenska Hydrograf. Biol. Kom. Skrift., 5 [1915], pp. 20, pl. 1, figs. 36*).—From the studies reported in detail in this article, the author concludes "that our climate underlies an evolution with cyclical changes ruled by lunar periods. . . . This holds not only for the Scandinavian countries but . . . for that part of Europe which underlies the influence of the Atlantic ocean. The oceanic circulation is the vehicle of the cosmic agents which rule our climate."

Data are presented to show that there is a connection between the sun-spot periods and variations in climate and weather, both phenomena being "caused by changes in the position of the moon's and the earth's orbit, the axes of these orbits periodically taking up symmetrical, i. e., parallel, and asymmetrical, i. e., oblique, positions relative to each other."

Distribution and variations in the mean air pressure over Europe, O. Freybe (*Landw. Jahrb., 47 (1914), No. 5, pp. 789–821, figs. 76*).—This subject is treated with reference to its bearing upon weather changes and weather predictions.

Report on meteorological observations at Wisley, 1914, R. H. Curtis (*Jour. Roy. Hort. Soc., 41 (1915), No. 1, pp. 74–87, figs. 4*).—The weather conditions of each month of the year are summarized and comparisons made with the normal.

"Taken as a whole, the year was a dry one, the rainfall being below the normal amount in seven months of the twelve; but the closing month of the year was one of almost unparalleled wetness. . . . The year was also a warm one, and the mean temperature exceeded the average in nine out of the twelve months, the relatively cool months being those of early summer."

A comparison of the temperature of the air with that of the soil at depths of 1 ft. and 4 ft. showed that "at the moderate depth of 1 ft. the soil retains right up to the close of the year much of the warmth it absorbs from the summer sunshine."

Composition of rainfall at Montevideo, 1909–1912, J. Schroeder (*Rev. Asoc. Rural Uruguay, 44* (*1915*), *No. 7, pp. 381–391*).—Chemical examinations of the rainfall at the Agronomic Institute of Montevideo (Sayago) for the whole of 1912 and for parts of 1908 and 1911 are reported.

The total rainfall during 1912 was 1.504 meters (59.21 in.), supplying 7.713 kg. of combined nitrogen per hectare (6.86 lbs. per acre) of which 3.68 kg. was ammoniacal nitrogen and 4.033 kg. was in the form of nitrites and nitrates. The rainfall of 24 months represented by the whole of 1912 and parts of 1908 and 1911 contained 13.71 kg. of nitrogen per hectare, or 6.855 kg. annually. The amount of sodium chlorid brought down by the rainfall of 1912 was 87.9 kg. per hectare, and for the 24 months named 165 kg.

The soot- and dust-fall of English towns and cities, J. B. C. Kershaw (*Chem. Trade Jour., 57* (*1915*), *No. 1482, pp. 363, 364, figs. 2*).—Observations on the soot- and dust-fall of twelve English towns and cities during periods varying from three to twelve months are reported. The average fall per month varied from 5.45 tons per square mile for Malvern to 79.79 tons for Oldham.

SOILS—FERTILIZERS.

Pike County soils, C. G. Hopkins, J. G. Mosier, E. Van Alstine, and F. W. Garrett (*Illinois Sta. Soil Rpt. 11* (*1915*), *pp. 48, pls. 3, figs. 5*).—This is the eleventh of the Illinois county soil reports.

Pike County lies in the southern part of the upper Illinois glaciation. The soils of the county are divided into three classes as follows: (1) Upland prairie soils rich in organic matter, (2) upland timber soils, including those areas upon which forests have grown for a sufficient length of time to change the character of the soil, and (3) swamp and bottom-land soils, including both the old and the new flood plains along streams. The yellow silt loam hill land occupies nearly one-third of the county, while the three most extensive upland timber soil types cover 60 per cent of the total area. "As a rule the variation among the different types of soil in Pike County with respect to their content of important plant food elements is not very marked, although the late bottom-land soils contain about twice as much nitrogen and phosphorus as the common upland timber soils. The most significant facts revealed . . . are the great abundance of potassium, the common lack of limestone, and the low content of nitrogen and phosphorus in the most extensive upland types." Methods of treating the soils are discussed.

Soil analyses (*Agronomia* [*Puerto Bertoni*], *5* (*1913*), *No. 9–12, pp. 389–394*).—The five predominating soil types of eastern and north-central Paraguay are described and average chemical and physical analyses reported.

The predominating type is a deep, permeable, very fertile forest soil of volcanic origin, containing much oxid of iron. The type next in extent is a soil of less depth than the first, which has a rocky subsoil and contains considerable fine sand. It contains more nitrogen than the predominating type and less phosphoric acid, potash, and lime. It also is said to be very productive.

The third type is a sandy sedimentary soil with a rocky subsoil, and is characterized by a high content of fine sand and silica, considerable clay, and a high content of sesquioxids of iron. The fourth type is a very sandy soil, very permeable, and characterized by a high content of fine silica, a low clay content, little nitrogen, and much potash, and is fairly well stocked with humus, lime, and iron. The fifth type is a very fertile forest soil. It contains considerable sand and clay and is fairly well supplied with the plant food constituents.

Past and present soil investigations in Norway, K. O. Björlykke (*Internat. Mitt. Bodenk., 5 (1915), No. 2, pp. 113–126, fig. 1*).—The history of soils investigations in Norway from the sixteenth century up to the present time is briefly described and the plan of present-day investigations is outlined.

The white soils of the Bram and Reinhard forests in the colored sandstone regions of the upper Weser River, K. Vogel von Falckenstein and G. von Romberg (*Internat. Mitt. Bodenk., 5 (1915), No. 2, pp. 77–101*).—In continuation of work previously noted (E. S. R., 31, p. 513) chemical, mechanical, and physical analyses of white soils are reported and discussed with reference to similar analyses of other miscellaneous related types, particularly the colored sandstone soils.

The white soils were found to be relatively rich in plant food, especially magnesia, potash, and phosphoric acid, as compared with the bleached topsoil of colored sandstone soil and dune sand. The ratio of alumina and silica soluble in hydrochloric acid and carbonated water was 1:1.8 in white soil and 1:7 in colored sandstone soil. A comparison of white soil with so-called sticky sandy soils showed them to be of very similar origin and to be similar in that they both have no leached-out upper layer.

The mechanical analyses, according to the Schöne method, showed that the colored sandstone soils have a much higher content of the finest constituents than white soils, while the latter have a high dust content. A certain parrallelism was found to exist between the weathered alumina and the finest particles in both white soils and colored sandstone soils, but no such parallelism existed with respect to dust content.

White soils and sticky sand soils were found to have a similar content of the finest particles. Mechanical analyses according to the Atterberg method showed that the colored sandstone soils contained about twice as much colloidal matter as white soils. A comparison of the mechanical analyses by the two methods led to the classification of the white soil as sandy loam and the colored sandstone soil as fine, sandy clay. The sandstone soils were also found to have a greater hygroscopicity and absorptive power for nitrogen than the white soils. The amount of voids in white soils decreased with the depth and was smaller than in loamy sandstone soils.

Cultivation and the incorporation of organic matter are thought to produce marked improvement in all these soils.

Influence of irrigation and of increased natural humidity on the processes of soil formation and of the transportation of salts in the soils and subsoils of the Golodnoĭ (Hungary) Steppe, Samarkand Province, N. A. Dimo (*Vli͡anīe Iskusstvennago Oroshenii͡a i Povyshennago Estestvennago Uvlazhnenii͡a na Protsessy Pochvoobrazovanii͡a i Peremi͡eshchenii͡a v Pochvo-gruntakh Golodnoĭ Stepi, Samarkandskoĭ Obl. Saratov, 1911, pp. 65, pl. 1, figs. 10; rev. in Zhur. Opytn. Agron. (Russ. Jour. Expt. Landw.), 15 (1914), No. 2, pp. 136–138*).—This report consists of ten sections.

In studies of alkali in soils growing wheat, it was found that only the arable layer (18 to 20 cm. in depth) had a large content of soluble salts, which reached on a bare spot as high as 14 per cent at a depth of from 3 to 5 cm. With two exceptions, sodium, magnesium, and calcium sulphates predominated.

From studies of orchard soils of the Golodnoĭ Steppe, it was considered evident that these soils, the clay subsoil of which had before cultivation contained small amounts of soluble salts, had undergone changes during the eight or nine years of horticultural tillage resulting in the transportation of water-soluble salts from the lower to the upper layers. Studies of the composition of irrigation water used showed that it contained from 0.015 to 0.009 per cent of chlorin, it being classified as very sweet water.

It was found that the alluvial soils of the valley of the Syr-Daria River are characterized by heavy salt-bearing subclays. To a depth of 50 cm. accumulations of the chlorid and sulphate of sodium were observed, while in deeper layers these salts decreased and the bicarbonate and carbonate of soda appeared in their place.

Investigations on the moisture conditions of a loam soil under different crops, C. von Seelhorst (*Jour. Landw., 63 (1915), No. 1, pp. 51–72, figs. 2*).—This article, supplementing and summarizing previous reports on the same subject (E. S. R., 14, p. 345; 18, p. 318), presents the results of 13 years' investigations on the moisture conditions of a loam soil under rye, wheat, oats, potatoes, beets, and peas. The purpose was to compare the water utilization of the different crops for the different years and to determine the influence thereon of summer rain, the size of crop, and the soil moisture conditions.

The average annual yield per acre of the different crops was as follows: Rye, grain 1,970 lbs., straw 4,370 lbs.; peas, grain 920 lbs., straw 2,000 lbs.; oats, grain 1,740 lbs., straw 3,300 lbs.; wheat, grain 2,175 lbs., straw 4,075 lbs.; potatoes 12,700 lbs.; and beets 58,500 lbs.

The following table gives the average monthly rainfall and the average monthly percentage of moisture in the soil under the different crops at depths of 25, 50, and 75 cm. (9.9, 19.7, and 29.6 in.), based on the dry weight of the soil:

Average rainfall and soil moisture records for 13 years.

Crop.	Average monthly soil moisture content at different depths.											
	April (average rainfall 1.73 inches).			May (average rainfall 2.29 inches).			June (average rainfall 2.79 inches).			July (average rainfall 2.94 inches).		
	Depth, 9.9 inches.	Depth, 19.7 inches.	Depth, 29.6 inches.	Depth, 9.9 inches.	Depth, 19.7 inches.	Depth, 29.6 inches.	Depth, 9.9 inches.	Depth, 19.7 inches.	Depth, 29.6 inches.	Depth, 9.9 inches.	Depth, 19.7 inches.	Depth, 29.6 inches.
	P. ct.	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*
Rye	21.0	21.8	22.1	17.8	19.9	21.4	16.3	17.2	19.0	16.8	16.8	19.0
Peas	22.2	22.0	22.5	20.5	21.2	22.2	17.1	19.0	21.0	16.7	15.9	18.5
Oats	22.3	22.2	22.5	20.1	21.5	22.0	16.1	17.4	19.6	16.3	15.7	16.7
Wheat	21.9	22.1	22.3	18.8	20.5	21.5	16.0	16.5	19.3	14.8	14.8	15.9
Potatoes	22.2	22.3	22.6	21.4	21.9	22.1	20.2	21.2	21.8	17.6	19.5	21.0
Beets	22.3	22.3	22.6	21.1	21.9	22.2	20.2	21.4	21.8	16.5	18.8	20.0
	August (average rainfall 2.74 inches).			September (average rainfall 2.29 inches).			October (average rainfall 1.73 inches).			November (average rainfall 2.1 inches).		
Rye	19.0	17.3	18.7	20.5	19.7	20.0	20.5	20.2	20.3	22.6	21.5	21.4
Peas	19.3	17.5	18.6	20.7	19.8	19.5	20.7	19.8	20.4	22.1	21.4	22.0
Oats	18.5	15.7	16.7	20.0	17.0	17.7	20.4	19.6	19.1	21.4	21.3	21.2
Wheat	17.9	14.8	16.3	20.1	18.6	18.2	20.2	20.0	19.7	22.2	21.3	21.2
Potatoes	18.4	18.5	19.6	19.9	20.1	20.8	20.5	20.4	20.8	22.0	21.2	21.6
Beets	16.8	16.9	18.7	19.0	18.2	17.8	20.0	19.5	19.4	22.2	20.9	20.3

The summer rains had the greatest influence on size of harvest. When very heavy they decreased the grain yield of straw crops, especially rye. Heavy summer rains were also unfavorable to potatoes, but favorable to beets. The maximum moisture content occurred in December and then only in the cultivated topsoil. The minimum occurred in August under wheat and in July of the same year under rye. The soil water at all three depths was utilized the least by potatoes, beets, and peas, and the most by wheat. These results are taken to indicate that potatoes, peas, and rye are crops adapted to light soils, while wheat, oats, and beets are adapted to heavy soils.

Influence of soil composition on medicinal plants, F. A. MILLER (*Jour. Amer. Pharm. Assoc., 3 (1914), No. 1, pp. 308–314; Lilly Sci. Bul., 1. ser., No. 6 (1915), pp. 219–226*).—In pot and field experiments with digitalis, stramonium, and belladonna on different soils using various commercial fertilizers it was found that sodium nitrate, potassium sulphate, a normal fertilizer, acid phosphate, and a mixture of equal parts of sodium nitrate and potassium sulphate had no effect on digitalis. A normal fertilizer caused an increase in the percentage of total alkaloids in stramonium. Sodium nitrate, potassium sulphate, acid phosphate, potassium nitrate, and a normal fertilizer caused a considerable increase in the percentage of alkaloids in the leaves of belladonna, but little change was produced in the alkaloid content of the roots.

In further experiments it was found that the transplanting of belladonna in soils of different composition caused a considerable decrease in percentage of alkaloids regardless of the soil treatment. The soils used were leaf mold, equal parts of clay and leaf mold, equal parts of clay and sand, equal parts of clay and the field soil in which the original plants were grown, and the soil in which they were originally grown. Even when grown in the same soil as the original plant the decrease in alkaloids varied from 20 to 57 per cent, while on widely different soils the difference in alkaloid yields was much smaller.

"The results as a whole indicate that further work is necessary on the influence of soil composition upon medicinal plants before any generalizations can be made."

The adsorptive power of soils, II, P. ROHLAND (*Internat. Mitt. Bodenk., 5 (1915), No. 2, pp. 102–112*).—This article represents the author's second contribution (E. S. R., 33, p. 420) to the subject. It deals with the adsorptive power of soils for salts, water, and coloring matter, especially the last, and explains the difference between adsorption and exchange of bases.

Soil colloids and their adsorptive power, P. ROHLAND (*Landw. Jahrb., 47 (1914), No. 2, pp. 239–247*).—This article covers practically the same ground as the above.

The injurious transformation of nitrogen in upland moor soils as a result of heavy applications of lime, T. ARND (*Landw. Jahrb., 47 (1914), No. 3, pp. 371–442, figs. 2*).—Chemical and biological studies of moss peat and heather humus from upland moor soils, with reference to the effect of adding lime in different quantities on the forms of available nitrogen present, are reported.

The results, in general, indicate that with increased liming of upland moor soils nitrate reduction increases, accompanied by nitrogen losses and the transformation of nitrate nitrogen into insoluble forms. The raw, strongly acid humus was found to be an unfavorable medium for the growth and activity of soil bacteria, but liming produced a neutral or alkaline reaction and made the conditions such that the bacterial activity of the soils increased with increasing lime additions. The following conclusions are drawn from these experiments:

Liming of an upland moor soil which had not received nitrogen fertilization resulted in a microbiological fixation of a part of the already small amount of

available nitrogen and thus decreased crop yields. Liming of an upland moor soil which had been fertilized with sodium nitrate caused a biological or biochemical decomposition of the nitrate, a part of the nitrogen of which was made unavailable to plants purely by denitrification and part by biological reduction of the nitrate to nitrite and by chemical decomposition of the nitrite, accompanied by nitrogen losses and transformation into insoluble organic forms.

It is generally concluded that the injurious action of the larger additions of lime to upland moor soils resulting in decreased crop yields can be attributed mainly to a gradual increase in the number and activity of soil bacteria with increasing decomposition of the soil.

Experiments on the action of certain humus preparations, particularly the so-called humus silicate, on plant growth, E. Haselhoff (*Landw. Jahrb., 47 (1914), No. 3, pp. 345–369*).—The work of others bearing on the subject is briefly reviewed and pot culture and field experiments to determine the fertilizing value of the so-called humus silicate fertilizer, alone and mixed with different other fertilizers, are reported. The humus silicate is a specially prepared fertilizer, consisting of moor soil, treated with caustic soda or potash, and alkaline silicates.

It was found in pot experiments that additions of humus silicate slightly increased the yield of barley on sand soil and of buckwheat on a loam soil, and increased the silica content in the straw of barley from sand soil. The humus silicate had no effect on beans on sandy loam soil and only a slight favorable effect on wheat. Additions of humus silicate to wheat increased the nitrogen content of both grain and straw, but had no effect on oats. Evaporation was less in uncropped soil treated with humus silicate than in untreated soil, and the water utilization by wheat was greater in treated than in untreated soil, while the opposite was true for oats. Pot experiments with oats on a loamy sand soil, with barley on loam and sand soils, and field experiments with beets, in all of which mixtures of humus silicate and other fertilizers were used, showed that the humus preparations had no special effect on the composition of the crops, especially with reference to nitrogen.

Further experiments on the formation of carbon dioxid from humus preparations in a medium heavy clay soil showed that the humus preparations contributed but little to carbon dioxid formation in soil and that the treatment of the organic matter of the preparation by alkalis had, in a large measure, prevented carbon dioxid formation.

From these experiments it is concluded that humus preparations are effective as fertilizers only to the extent to which they contain plant food and that the humus content is of no special value.

Sulfofication in soils, P. E. Brown and E. H. Kellogg (*Iowa Sta. Research Bul. 18 (1914), pp. 49–111; Centbl. Bakt.* [*etc.*], *2. Abt., 43 (1915), No. 19–24, pp. 552–601*).—This bulletin reports investigations on bacterial action in soils in its relation to sulphur oxidation in the soil and on methods of measuring such bacterial action and determining the sulphate content of soils.

Preliminary tests showed that the sulphates in soils are not completely extracted by dilute hydrochloric acid because of the interference of organic substances and iron compounds but may be extracted by shaking for from 6 to 8 hours with water. Grinding the soil was found to be unnecessary for this purpose, although the finer the soil the more readily were the sulphates dissolved. Calcium sulphate was the most difficult of the sulphates to dissolve, but it was dissolved quite readily upon shaking with water for the time specified. The sulphur photometer proved to be well adapted to the determination of sulphates in soils.

The author concludes that soils have a definite sulfofying power which is determinable in the laboratory, as shown in a previous article (E. S. R., 31, p. 318), and that the process of sulfofication is mainly brought about by bacterial action, although a small production of sulphates in soils by chemical action is considered probable. Free sulphur was oxidized much less readily in the soil than the sulphids of sodium, potassium, and calcium.

The preferred method of measuring sulfofication is to add 0.1 gm. of free sulphur to 100 gm. of fresh soil, incubate for from 5 to 10 days with a moisture content of 50 per cent of saturation, leach out the sulphates with water, precipitate with barium chlorid, and determine with the sulphur photometer.

Additions of organic matter to the soil in the form of manure and green manure increased the sulfofying power up to a certain point. The optimum moisture content of the soil for sulfofication was found to be 50 per cent of the amount necessary for complete saturation. This is taken to indicate that optimum sulfofication may occur in soils which contain the optimum moisture content for crop growth. Aeration of the soil by mixing with sand up to 50 per cent of each increased sulfofication, beyond which point a depression occurred. The addition of carbohydrates to the soil depressed sulfofication, the greater the amount added the greater the depression. The depression also varied in inverse ratio to the solubility of the carbohydrates.

Greenhouse tests with a loam soil showed that applications of 25 tons of horse manure or cow manure and 4 tons of clover hay exerted similar effects on sulfofication and on the yield of timothy. "At first there was a depression in sulfofication and an injury to the crop, but this was followed by an increase both in sulfofying power and in crop yield. Calcium sulphate applied to the soil at the rate of ½ ton per acre increased slightly the crop yield, but the ½ ton of CaS which was found to be completely oxidized in a short time to the sulphate, corresponding, therefore, to the addition of a larger application of the sulphate, gave no increase in crop. The sulfofying power of the soil was increased to a very large extent in both cases, the larger amount of calcium sulphate giving the greater effect. The transformation of CaS into sulphate in this particular soil was shown to be very rapid and the oxidation of the sulphur in the manures was only slightly less rapid."

Analyses of typical Iowa soils are also reported, the results of which are taken to indicate that sulphur may be lacking and that this element should not be neglected in systems of permanent agriculture.

A review of the work of others bearing on the subject is included.

Sulfofication in soils, P. E. Brown and E. H. Kellogg (*Proc. Iowa Acad. Sci., 21 (1914), pp. 17–22*).—The substance of this article is noted above.

Field tests with a toxic soil constituent: Salicylic aldehyde, O. Schreiner and J. J. Skinner (*Jour. Amer. Soc. Agron., 6 (1914), No. 3, pp. 108–113, pls. 2; abs. in Chem. Abs., 9 (1915), No. 12, p. 1653*).—The substance of this article has been noted from another source (E. S. R., 31, p. 620).

Soil protozoa, G. P. Koch (*U. S. Dept. Agr., Jour. Agr. Research, 4 (1915), No. 6, pp. 511–559*).—Four sets of laboratory experiments on (1) methods for counting protozoa, (2) protozoa of greenhouse soils, (3) protozoa of field and greenhouse soils, and (4) the effect of temperature upon the development of soil protozoa are reported which were conducted at the New Jersey Experiment Station. In these experiments small ciliates were classified to include all organisms from the smallest to and including *Colpidium colpoda* and the large ciliates included all forms larger than *C. colpoda*.

Tests showed an improved loop method for counting protozoa, devised by the author, to be more satisfactory than methods previously used. This consists in counting the living protozoa in the amount by weight of culture solution which

can be transferred by a platinum wire loop to the ruled area of a clean glass slide.

Comparing the development of protozoa in artificial culture solutions of different kinds, inoculated with varying amounts of soil, with moist and dry soils, and with different kinds of greenhouse soils, it was found that the maximum development of small and large ciliates and flagellates in dried-blood extract was from the third to the fourth day, while in soil extract it was from the second to the fifteenth day, depending upon the character and amount of soil used for inoculation. The soil extract seemed to be the more favorable medium. When the maximum development of all organisms was reached, there was a gradual decrease in numbers until very few active forms were present. The most rapid development of protozoa occurred in the culture solutions inoculated with the largest quantities of soil. Per gram of soil, there was the greatest development from the least amount of soil used. The flagellates were the first organisms to excyst and developed in greatest numbers. Drying the soil slightly favored the development of flagellates in soil extract, while with dried blood there was little difference. More large and small ciliates developed from the less composted soils. In dried blood more flagellates developed from the more heavily manured soils. Very many different types of ciliates were present, while the types and numbers of amebæ were few.

In further studies of the development of protozoa in different culture solutions with varying amounts of soil inoculations and to compare the numbers and types of protozoa developed from compost and field soils, it was found " that in developing protozoa from the soil in artificial culture solutions different numbers and types of protozoa will be developed for every variation in the amounts of each soil used for inoculation and with every culture solution used."

Experiments dealing with the numbers and types of soil protozoa appearing at various temperatures in artificial culture solutions inoculated with soils of different origin showed that a temperature of 15 to 16° C. was the most favorable for the development of small ciliates, hay infusion being the most favorable culture solution at this temperature. The maximum development of small ciliates occurred earlier in dried blood than in hay infusion, varying at 6 to 7° from 17 to 30 days after inoculation and at 15 to 16° from 7 to 25 days after inoculation. Large ciliates developed at all the temperatures noted. The maximum development of flagellates occurred at 6 to 7° in dried-blood extract and at 15 to 16° in hay infusion. Dried-blood extract and hay infusion were unfavorable media for the development of large ciliates, while hay infusion was the most favorable medium for the maximum development of flagellates. As with the small ciliates, the higher temperatures encouraged and the lower temperatures retarded the early development of flagellates. At all temperatures the flagellates developed sooner than the ciliates, appearing 4 or 5 days earlier at 15 to 16°. Species of Vorticella, Colpoda, Prorodon, and Glaucoma developed at 15 to 16°, at 22 to 23°, and at 29 to 30°, the last temperature being very favorable for the development of the last three types. A few individuals of Colpoda and Paramecium developed at 6 to 7°. At 15 to 16° Colpoda was the most numerous ciliated form. Vorticella cysts were present in field soils which had received applications of manure. Hay infusion and dried-blood extract were unfavorable media for the development of amebæ.

General conclusions drawn from the experiments are that the development of soil protozoa in artificial culture solutions varies (1) with the kind of media employed, (2) the quantity of soil used for inoculation, (3) drying of the soil, (4) different kinds of soil and different soils of the same kind, and (5) the temperature of incubation.

A list of references to literature bearing on the subject is appended.

[Address of the President of the section on agriculture], A. D. HALL (*Rpt. Brit. Assoc. Adv. Sci., 1914, pp. 636–645*).—This address, which dealt mainly with the reclamation of waste lands, has already been noted from another source (E. S. R., 32, p. 30).

The fertilizer requirements of soil, F. MÜLLER (*Landw. Jahrb. Schweiz, 29 (1915), No. 1, pp. 119–134*).—The results of several years' field experiments with hay at three rather widely separated Swiss experiment stations are reported, and confirm the reliability of Wagner's method for determining the fertilizer requirements of a soil growing hay.

This method is based on analyses showing that hay contains from 0.77 to 3.14 per cent potash, or an average of 1.6 per cent. A 2 per cent potash content in the hay is, therefore, taken to indicate saturation of the soil with potash and more than 2 per cent indicates oversaturation. If the hay contains 1.8 per cent potash, it is possible to increase the yield by heavy potash fertilization, and if it contains only 1.4 per cent, the probability of increasing the yield is very great. If the potash content sinks to 1.2 per cent or less, a deficiency is certain. The phosphoric acid content of hay varies between 0.28 and 0.8 per cent and must be about 0.7 per cent to indicate saturation. If the hay is saturated, about 200 lbs. of phosphoric acid is needed annually to produce about 8,900 lbs. of hay per acre.

It is considered feasible under Swiss conditions for a farmer to obtain an analysis of a sample of his hay from the nearest experiment station and by using this method to determine the fertilizer requirements of his meadow land.

Fertilizer tests on different crops, C. DUSSERRE (*Ann. Agr. Suisse, 16 (1915), No. 1, pp. 73–82*).—Fertilizer tests with phosphatic, potassic, and nitrogenous fertilizers on meadow, pasture, vineyard, and cereal soils are reported.

Both superphosphate and Thomas phosphate were profitably used on meadow soils for the production of forage crops. On ordinary meadow soils the addition of potash salts was not profitable, while on calcareous peat soils it was accompanied by a profitable increase in crops. Nitrogenous fertilizers, while producing an increase in crop, were not profitably used on meadow soils.

Tests on a wet clay pasture soil of a complete fertilizer and of fertilizers lacking either potash or nitrogen showed that the largest profit was obtained with the complete fertilizer and the smallest with the fertilizer lacking potash. Tests on vineyard and truck soils of manure alone, a complete fertilizer, and a mixture consisting of manure and complete fertilizer 1:1 showed that the mixture was the most profitable. It was also found that potash fertilizers increased the resistance of truck crops to freezing.

Tests on vineyard soils of complete fertilizers containing sodium nitrate or lime nitrogen showed that the best results were obtained with the sodium nitrate. A marked increase in the yield of oats was obtained when kainit was used for the destruction of weeds. Tests with wheat and oats demonstrated the practicability of reinforcing barnyard manure with mineral fertilizers on soils rich in humus.

How not to treat Illinois soils, C. G. HOPKINS (*Illinois Sta. Circ. 181 (1915), pp. 3–32*).—This is an address by the author before the Illinois State Farmers' Institute at Harrisburg, February 23, 1915, in which he reviews work by himself and others on soil improvement and emphasizes that profitable results from soil treatment can be obtained only through intelligent and careful consideration of all environmental factors and through systematic methods of procedure.

Unexhausted manurial values: A criticism with some suggestions, J. HENDRICK (*Trans. Highland and Agr. Soc. Scot., 5. ser., 27 (1915), pp. 256–280*).—The author offers criticisms on the tables and conclusions of Voelcker and Hall

(E. S. R., 31, p. 221) and suggests alterations in the present method of estimating the unexhausted values of manures and of feeding stuffs. The method suggested differs from that of Voelcker and Hall in that it distinguishes between digestible and indigestible nitrogen, and it assumes that only half the digestible nitrogen is recovered in the dung heap under good conditions of dung making, that the indigestible nitrogen together with the phosphoric acid and potash of feeding stuffs require four years for exhaustion, and that one-half of the value remaining is exhausted in each season.

The composition and value of liquid manure, J. HENDRICK (*North of Scot. Col. Agr. Bul. 19 (1915), pp. 29*).—This bulletin reports investigations "undertaken (1) to determine the chemical composition of liquid manure produced under the farming conditions of the northeast of Scotland, and (2) by means of field experiments to determine how far dressings of liquid manure given at various times during the winter under the ordinary conditions of practice will produce increases of crop."

Analyses of a large number of samples of liquid manure from different farms at each of the three periods during the winter or early spring when liquid manure was being applied showed that individual samples differed greatly from one another and that even the average analyses from different farms differed greatly. The results of analyses of 35 samples are summarized in the following table:

Composition of liquid manure.

	Water.	Solids.	Total nitrogen.	Ammoniacal nitrogen.	Phosphoric acid.	Potash.	Lime.
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
Maximum	99.33	3.54	0.470	0.410	0.090	1.030	0.043
Minimum	96.46	.67	.088	.060	.004	.128	.003
Average	98.21	1.79	.204	.179	.029	.462	.019

The manurial constituent present in greatest proportion was potash. Considerable nitrogen, nearly all of which was in the form of soluble ammonia compounds, was present, but there was on the average more than twice as much potash as nitrogen present. Phosphoric acid and lime were present only in very small amounts. Analyses of fresh urine from feeding bullocks showed that it contained 0.163 per cent of total nitrogen and only 0.012 per cent of ammonia nitrogen.

In four years' field fertilizer experiments with liquid manure on quarter-acre plats of hay land the liquid manure was applied at different times during the winter, the standard dressing being 2,000 gal. per acre applied in two portions of 1,000 gal. each with an interval of a few days between. It was found that a marked increase of hay crop was obtained from the application of liquid manure in winter or early spring. Treatment with liquid manure had no bad effect on clover, but was on the contrary distinctly beneficial in several of the experiments. The after effect of treatment with liquid manure was also good.

While a remunerative return was obtained from an application of 2,000 gal. of liquid manure per acre a correspondingly greater return was not obtained when 4,000 gal. per acre were applied. In several cases with the heavier treatment the crop was too heavy and was inclined to lodge. It is concluded that about 2,000 gal. of liquid manure per acre for hay land is sufficient and that the profit realized by such an application is sufficient to justify the trouble and expense of applying the liquid manure instead of letting it go to waste.

Composition of liquid manure as shown by agricultural investigations in southern Switzerland, C. DUSSERRE (*Ann. Agr. Suisse, 16 (1915), No. 1, pp. 83–88*).—Analyses of 23 samples of typical liquid manure from southern Switzerland show that potassium is the fertilizing element present in the greatest amounts, and that liquid manure from that locality is essentially a potash-nitrogen fertilizer and should be completed by adding a phosphatic fertilizer. The average of the analyses shows that the fertilizing elements are present in the proportion of 100 parts of nitrogen to 285 parts of potassium to 4 parts of phosphoric acid.

Observations on the relative value of the most important nitrogen fertilizers, S. OSWALD, W. WEBER, and T. REMY (*Landw. Jahrb., 47 (1914), No. 1, pp. 79–106; abs. in Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases, 6 (1915), No. 3, pp. 392–394; Chem. Abs., 9 (1915), No. 12, p. 1651; Chem. Zentbl., 1915, I, No. 5, p. 215*).—The authors review work by themselves and others bearing on the subject, and report the results of seven years' field experiments with sugar beets, rye, oats, potatoes, and peas on a relatively fertile deep loam soil to determine the relative values of sodium nitrate, ammonium sulphate, blood meal, and lime nitrogen as sources of nitrogen.

Considering all incidental expenses, it was found that the average increased crop values produced by the different fertilizers were so nearly the same that the differences fall within the limits of error. It is concluded from these results that it is impossible to express by figures the relative values of the different nitrogen fertilizers tested, since the working value of each fertilizer varies with the conditions under which it is used. The superiority found by others for sodium nitrate is attributed to the facts that it has practically no after effect and that its relative availability to plants makes its activity less dependent on the conditions under which it is used than that of the other fertilizers. The average effective values of sodium nitrate and ammonium sulphate were practically the same. Lime nitrogen proved to be especially valuable in increasing the yield of beets and potatoes, being in this respect practically equal to sodium nitrate. A mixture of lime nitrogen and sodium nitrate is recommended for sugar and red beets.

The better method of using ammonium sulphate, L. MALPEAUX (*Vie Agr. et Rurale, 5 (1915), No. 4, pp. 61–65*).—Experiments are reported in which the author observed the influence of ammonium sulphate fertilization in a fertile sandy clay soil when applied at the surface and at depths of 5, 10, 17, and 30 cm. The ammonium sulphate was applied at the rate of 400 kg. per hectare (356 lbs. per acre), and part of each plat was kept fallow and part planted to sugar beets.

The results with reference to nitrification of ammonium sulphate were fairly concordant in both fallow and cropped soils, but more nitrate was found in the former. In general the most nitrate was found in the layers from 10 to 20 and from 20 to 30 cm. in depth in the plats fertilized at different depths. When fertilized at the surface the most nitrate was found in the top 10 cm. of soil. The best yield of sugar beets was obtained when ammonium sulphate was added at a depth of 10 cm., but good yields were obtained at the other depths of fertilization. Much smaller yields were obtained with surface fertilization. The effect of fertilization at 5 cm. depth was much slower than at other depths, and the beets were mostly top.

From these results it is concluded that surface fertilization with ammonium sulphate under similar conditions is not practical, and that for sugar beets ammonium sulphate had best be applied in the spring at a depth of 10 cm.

See also a note of similar experiments with sodium nitrate (E. S. R., 30, p. 623).

Fertilizer experiments with transformation products of lime nitrogen, H. KAPPEN (*Landw. Vers. Stat., 86 (1915), No. 1–2, pp. 115–136, fig. 1*).—Plat fertilizer experiments with mustard on a light sandy garden soil to determine the relative values of urea obtained from lime nitrogen by a patented process, urea nitrate, ammonium sulphate, guanidin nitrate, and sodium nitrate as sources of nitrogen are reported. Thirty walled-in plats 1 meter deep and having 1 square meter (10.76 sq. ft.) of surface were used. The soil before treatment had a total nitrogen content of 0.051 per cent. The plats were completely fertilized, receiving 2.5 and 5 gm. of nitrogen in the different forms mentioned.

The increase in dry matter and nitrogen in the crops of the fertilized plats over those of the control plats indicated that sodium nitrate in single and double applications produced the best results, followed in order by urea, ammonium sulphate, urea nitrate, and guanidin nitrate. There was, however, little difference between the results obtained by single and double applications of sodium nitrate and by double applications of sodium nitrate and of urea. Considering the effectiveness of the nitrogen of the sodium nitrate to be 100, the relative values of the other fertilizers were estimated from the results obtained to be 78 for urea, 53 for ammonium sulphate, and 35 for urea nitrate.

To determine the after effect of the different fertilizers, mustard was again planted on the same soil. Better results were obtained with single than with double applications of urea in these tests, and the guanidin nitrate, which produced an almost negligible increase in crop yield in the first experiments, had a marked after effect. Ammonium sulphate and urea nitrate had a less marked after effect and sodium nitrate in both single and double applications had very little after effect.

Considering the total increase in crop yield in both experiments, the urea stood first in value, followed closely by sodium nitrate, while the other fertilizers showed the same relative values. Laboratory tests of the urea nitrate and guanidin nitrate used in the plat experiments led to the conclusion that the relative inactivity of these fertilizers is due to their content of dicyandiamidin nitrogen, only a small part of which is available to plants.

Ammonification experiments in a garden soil with urea, dicyandiamidin nitrate, and guanidin nitrate showed that the urea was rapidly ammonified, while ammonification was very slow and limited in the soil treated with the other two fertilizers. The guanidin nitrate is, however, considered to be of some value as a nitrogenous fertilizer, owing to its nitrate content.

[Experiments with superphosphates], A. J. PERKINS and W. J. SPAFFORD (*Jour. Dept. Agr. So. Aust., 18 (1915), No. 6, pp. 484–496*).—Detailed results of experiments with superphosphates on wheat and grass lands in South Australia from 1905 to 1913, inclusive, are reported.

These results have shown that water-soluble phosphatic fertilizers are very effective on the greater part of the South Australian wheat and grass lands. An application of 2 cwt. of superphosphate increased the wheat crop on the average 36 per cent, the hay crop 37 per cent. The effect was much more pronounced in dry seasons than in wet seasons and was least pronounced in late seasons. Wheat receiving superphosphate blossomed and matured earlier than unfertilized wheat. An application of 2 cwt. of superphosphate gave higher yields than either 1 cwt. or 3 cwt. Applications of from ½ to 3 cwt. on the wheat crop very materially improved the grazing capacity of the land when left out of cultivation, the improvement being in proportion to the amount of superphosphate applied. The combined cropping and grazing cash returns exceeded the cost of the fertilizer used and there was a net balance of profit when the application of superphosphate did not exceed 2 cwt. An application of 3 cwt. of

superphosphate gave higher gross returns from combined cropping and grazing, but the increase was not sufficient to pay for the extra fertilizer.

Phosphatic manures, A. J. PERKINS (*Jour. Dept. Agr. So. Aust., 18 (1914), No. 5, pp. 407–412; 18 (1915), No. 6, pp. 503–512*).—This is a lecture based on the experimental results noted above.

A note on the formation of tricalcium phosphate on mixing ground limestone with acid phosphate, R. N. BRACKETT and B. FREEMAN (*Jour. Indus. and Engin. Chem., 7 (1915), No. 7, p. 620*).—Experiments are briefly reported which show that tricalcium phosphate is produced on mixing acid phosphate and ground limestone in the proportions of 14, 15.5, 17, and 10 lbs. of acid phosphate to 6, 4.5, 3, and 10 lbs., respectively, of ground limestone. The formation of tricalcium phosphate began immediately on mixing, but increased slightly on standing, which is taken to indicate that the amount formed is a function of both time and temperature. It is considered necessary, therefore, that the formation of insoluble phosphate in such mixtures be taken account of by manufacturers in making guaranties.

Potash in the Texas Permian, J. A. UDDEN (*Bul. Univ. Tex., No. 17 (1915), pp. 59, pls. 4*).—This bulletin reports the discovery of a red potash-bearing salt in three wells in western Texas. One of the two most important wells is in Potter County, 23 miles northwest of Amarillo, and the other about 30 miles away in Randall County, 16 miles from Amarillo. In the Potter County well the highest amount of potash found, expressed as percentage of the soluble portion, was 9.23 per cent, taken at a depth of from 875 to 925 ft. In the Randall County well the highest amount of potash found was 10.5 per cent, from a depth of 1,700 ft. It is believed "that the problematic existence of utilizable potash in association with the Permian salt beds in the southwest is, by these finds, rendered sufficiently probable to warrant the beginning of explorations. . . . The data presented show that extensive salt beds underlie not only the greater part of the Panhandle, but that they extend south of Upton County and west into New Mexico. . . . From the explorations already made, it is evident that tests should extend to the greatest depth at which it may be considered profitable to work, say 2,000 ft."

Seaweed as a source of potash for agriculture, A. A. MOFFATT (*Trans. Highland and Agr. Soc. Scot., 5. ser., 27 (1915), pp. 281–286*).—In a discussion of the fertilizing value of seaweed from the coasts of Ireland and Scotland it is stated that the fresh seaweed contains about 80 per cent water. Draining and air-drying reduce the water content to about 10 per cent. Three methods of treatment of seaweed to realize its value as a potash fertilizer are described, which involve burning at a great heat to produce kelp, burning to a loose ash, and carbonizing, followed by special treatment to extract the potash compounds. While the methods involving reduction to kelp and carbonizing show prospects for future development, it is thought that for the present burning the seaweed to a loose ash is the most practicable method of using it.

Experiments with potash waste liquor lime (Endlaugenkalk), E. HASELHOFF and O. SCHMIDT (*Landw. Jahrb., 47 (1914), No. 3, pp. 325–337*).—Pot culture and field experiments to determine the fertilizing value of a mixture of lime and waste liquor from potash industries are reported. Two different mixtures were used, the first containing 37.8 per cent of lime, 1.89 per cent of magnesia, 1.87 per cent of potash, 0.74 per cent of sodium, 4.72 per cent of chlorin, and 1.97 per cent of sulphuric acid, and the second containing 46.72 per cent of lime, 6.23 per cent of magnesia, 1.22 per cent of potash, 0.95 per cent of sodium, 9.76 per cent of chlorin, and 1.35 per cent of sulphuric acid.

It was found in pot experiments that the yield of garden beans on a sand soil was decreased. On a loam soil the total yield of horse beans was de-

creased and on a sand soil the straw yield was decreased, although the lime and potash contents of both grain and straw were not appreciably influenced. No effect of the waste liquor lime mixture was observed with oats and summer wheat on a mild loam soil. In field experiments the mixture had no bad effects on beets on a loam soil and was, on the whole, more favorable to them than burned lime.

It is concluded from these experiments that while the chlorids of the waste liquor lime mixture were injurious to plant growth in pot experiments, the amounts present are so small as to have no bad effect in field experiments. It is further concluded that waste liquor lime mixture of the composition first noted may be profitably used where liming is needed, in case it may be obtained at about half the cost of burned lime.

A precautionary statement regarding the protection of the mixture against rain is added.

Potash and lime in agriculture and the arts, G. W. Coggeshall (*Nat. Lime Manfrs. Assoc. Bul. 6 (1915), pp. 16; abs. in Engin. Mag., 49 (1915), No. 4, p. 578*).—This bulletin gives a general discussion of the value of fertilizers in agriculture, dealing particularly with potash.

A process for obtaining water-soluble potash salts from feldspathic rock, which is thought to eliminate the disadvantages of other methods used, is described. This process consists of powdering 100 parts of feldspar rock with 20 parts of burned lime and sprinkling a solution of calcium chlorid upon a moving layer of the powdered mixture. The calcium chlorid unites with the lime to form balls or clumps and these are fed to a rotary kiln. The formation of the clumps is said to produce an intimate mixture between the feldspar and flux. "The clumps passing down the kiln are heated by the powdered coal blast to a bright red in the same outward form in which they entered but with the potash dissociated from the silica of the feldspar and united with the chlorin of the calcium chlorid to form muriate of potash. The lumps fall hot into water and the potash salt is leached out, producing a 10 per cent solution of potassium chlorid. This solution is sprayed down through the hot waste gases of the kiln, the water evaporated, and a hot concentrated solution obtained. This solution is dried at this point or by passing through a rotary drier using the hot gases from the rotary lime-burning kiln. The final product is identical with the muriate of potash obtained from Germany." Other accounts of this process have previously been noted (E. S. R., 27, p. 724; 29, p. 518; 32, p. 324).

Experiments on the influence of potassium ferrocyanid on plant growth, E. Haselhoff (*Landw. Jahrb., 47 (1914), No. 3, pp. 338–344*).—Soil pot culture experiments with beans on loam and sand soils and water culture experiments with beans are reported, the purpose of which was to determine the effect of potassium ferrocyanid on plant growth.

The soil culture experiments showed that potassium ferrocyanid had a bad effect on the crop yield in loam, while only the straw yield was unfavorably affected in the sand soil. The water culture experiments showed that the injurious effect of potassium ferrocyanid toward plant growth began at a concentration of from 0.1 to 0.5 gm. of potassium ferrocyanid to 1 liter of nutritive solution and that at the higher concentration the injurious effect was very marked.

Sulphur and permanent soil fertility in Iowa, P. E. Brown and E. H. Kellogg (*Jour. Amer. Soc. Agron., 7 (1915), No. 3, pp. 97–108*).—The authors summarize the results of investigations made at the Wisconsin and Kentucky experiment stations and report studies of typical Iowa soils with reference to their sulphur content.

Using the sodium peroxid fusion method for sulphur determination, samples of the Missouri loess, the Mississippi loess, the southern Iowa loess, the Wisconsin drift, and the Iowan drift soils were analyzed. The samples were taken at three depths, 0 to 6⅔ in. representing the surface soil, 6⅔ to 20 in. the subsurface soil, and 20 to 40 in. the subsoil.

There was found to be a considerable variation in the sulphate content of different soils of the same type, although there was not a wide variation in the total sulphur content in the surface soils in the different soil areas. The Wisconsin drift was the richest in sulphur, followed in order by the Iowan drift, the southern Iowa loess, the Missouri loess, and the Mississippi loess. In general the drift soils appeared to contain more sulphur than the loess soils, at least in the surface soil. In the subsurface soil the Mississippi loess was again the lowest in sulphur and the Wisconsin drift the highest, but the Missouri loess was higher than the southern Iowa loess or the Iowan drift soil. In the subsoil the Missouri loess showed a slightly larger amount of sulphur than the Wisconsin drift, while the Mississippi loess and the southern Iowa loess showed less than these two and were about the same in sulphur content. The Iowan drift subsoil contained the smallest amount of sulphur.

A comparison of the average amounts of sulphur and of phosphorus in these soil areas showed that the sulphur content is on the average much less than that of phosphorus. The results as a whole are taken to indicate that all systems of permanent fertility in Iowa must include the maintaining of the sulphur supply in the soil. Acid phosphate, supplying both phosphorus and sulphur, is suggested as a logical fertilizer for these soils.

Composition of certain fish fertilizers from the Pacific coast and the fertilizer value of degreased fish scrap, J. R. LINDEMUTH (*Amer. Fert., 42 (1915), No. 11, pp. 44–50, figs. 3; Jour. Indus. and Engin. Chem., 7 (1915), No. 7, pp. 615–619, figs. 3*).—Analyses of waste from salmon and other fish-canning industries on the Pacific coast are reported, together with pot experiments made to determine the fertilizing value of fish waste.

The results are taken to indicate that the fish waste of the Pacific coast is very high in fertilizer value, average analyses being as follows: Nitrogen 9.31 per cent, phosphoric acid 6.72 per cent, and oil 12.69 per cent. In pot experiments with wheat on loam and sandy loam soils in which fish scrap was added at the rate of 700 lbs. per acre it was found that in every case where scrap was added there was a decided increase in crop growth and that when oil-free scrap was added a still greater growth was noticeable.

Commercial fertilizer "1915 yearbook" (*Atlanta, Ga.: Walter W. Brown, 1915, pp. 190, figs. 9*).—This yearbook contains directions of fertilizer manufacturers, allied fertilizer trades, and cotton-seed oil mills, and special articles and miscellaneous information relating to the fertilizer industry. Among the more important special articles included are the following:

Chemical Control of a Fertilizer Plant, by E. H. Armstrong; "The Soil Doctor"—Chemical Examination of Soils, by W. H. MacIntire; The Search for Potash Salts in the United States, by W. C. Phalen; Soil Analysis as a Guide to Fertilization, by W. B. Duryee, jr.; Contributions of the Chemist to the Fertilizer Industry, by H. W. Wallace; Importance of Fertilizers in Crop Production, by Soule; Making Fertilizers from an Agricultural Editor's Viewpoint, by E. S. Bayard; Production of Phosphate Rock in Florida during 1914, by E. H. Sellards; The Western Ammoniate Market in 1914 and Effect of the War, by J. B. Sardy; The Fixation of Atmospheric Nitrogen, by W. S. Landis; Radioactive Ores and Plant Life, by H. Bastin; Five Years of Cyanamid in America, by E. H. Franke; Potash and a Home Supply, by C. P. Steinmetz; and Contributions of the Chemist to the Cotton Seed Industry, by D. Wesson.

The American fertilizer handbook (*Philadelphia: Ware Bros. Co., 1915, 8. ed., pp. 402, figs. 19*).—This handbook contains, as usual, directories of fertilizer manufacturers, allied fertilizer trades, cotton-seed oil mills, chemists and engineers, fertilizer materials and machinery, and packers and renderers, together with special articles, statistics, and miscellaneous information relating to the fertilizer industry. Among the more important special articles included are the following:

German and other Sources of Potash Supply, by C. H. MacDowell; The Sulphuric Acid Industry, by A. M. Fairlie; Dictionary of Fertilizer Materials, by T. C. Pinkerton; Five Years of Cyanamid in America, by E. J. Pranke; Phosphate Rock Production in 1913, by W. C. Phalen; Phosphate Rock Production in 1914, by W. C. Phalen; Florida Phosphate Rock, 1914, by E. H. Sellards; The Products and Composition of Cotton Seed, by T. C. Low; Cottonseed Meal as a Fertilizing Material, by A. M. Soule; and The Western Animal Ammoniate Market, by J. B. Sardy.

AGRICULTURAL BOTANY.

Studies on periodicity in plant growth.—I, A four-day periodicity and root periodicity, R. A. Robertson and Rosalind Crosse (*Proc. Roy. Soc. Edinb., 33 (1912–13), No. 1, pp. 85–102, pls. 3, figs. 2*).—This study as described has led to the general conclusions that there occurs in elongating plant organs a four-day periodicity apparently due in part to internal causes, but also affected by external conditions. Roots exhibit a daily periodicity, which is correlated with that shown by the stem.

Studies on periodicity in plant growth.—II, Correlation in root and shoot growth, Rosalind Crosse (*Proc. Roy. Soc. Edinb., 35 (1914–15), No. 1, pp. 46–53, pls. 2*).—The author reports an extension of the work above noted.

It is stated that the root and shoot rhythms are correlated, varying with changing conditions. No evidence has been obtained regarding the disappearance of the periodicity under uniform conditions, whether of light or darkness, indicating the automatic nature of the phenomenon.

An automatic method for the investigation of velocity of transmission of excitation in Mimosa, J. C. Bose (*Phil. Trans. Roy. Soc. London, Ser. B, 204 (1913), No. 305, pp. 63–97, figs. 25*).—Giving an account of studies on Mimosa by means of apparatus for which great delicacy is claimed, the author holds that the results obtained prove that the transmission of excitation is a process fundamentally alike in animals and in plants, being in both cases a propagation of protoplasmic change.

The influence of homodromous and heterodromous electric currents on transmission of excitation in plant and animal, J. C. Bose (*Proc. Roy. Soc. [London], Ser. B, 88 (1915), No. B 607, pp. 483–507, figs. 10*).—The author gives an account of studies, suggested by the results of the studies above noted, on the variations of conductivity produced by the directive action of an electric current.

It is stated that in the conducting tissue of a plant, as in the nerve of an animal, the passage of a current induces a variation in the conductivity as regards excitation. In cases involving feeble intensity, a heterodromous current, or one opposite in direction to that of propagation of excitation, enhances the conduction of excitation, while a homodromous current or one in the direction of propagation of excitation, depresses it. The after effect of a current is a transient conductivity variation, opposite in sign to that induced during the continuation of the current. The normal conductivity variation undergoes a reversal under a strength of current above the critical value, the heterodromous

current then inducing a depression, while the homodromous current induces an enhancement of conductivity.

Variations in respiratory activity in relation to sunlight, H. A. SPOEHR (*Bot. Gaz., 59 (1915), No. 5, pp. 366–386, figs. 10*).—This paper is a prefatory announcement of a reaction believed to be caused by light through its effects on the environment of the organism.

Experiments described as carried out with onions, beetles, and (principally) wheat seedlings are claimed to show that respiratory activity is greater during the hours of sunlight, corresponding thus in a general way to the period of atmospheric ionization. No increased respiratory activity could be obtained with the artificial sources of light.

On the function of chlorophyll, A. J. EWART (*Proc. Roy. Soc. [London], Ser. B, 89 (1915), No. B 609, pp. 1–17*).—Referring to the report published by Wager (E. S. R., 31, 222), the author gives a general account of his own related work to the present time.

Results of studies described indicate that the assimilation of carbon dioxid is not a simple process, but a very complex one, reversible in part, in which at least the two pigments chlorophyll and xanthophyll and their derivatives take part. Light supposedly influences the equilibrium between the reacting substances and their products accelerating the tendency to oxidation on the part of the pigments concerned.

No peroxids are produced during the photo-oxidation of chlorophyll, xanthophyll, or carotin, but these substances, given light and oxygen, may act as oxidases to themselves and to such substances as hydriodic acid, litmus, or guaiacum. Some facts suggest that chlorophyll may be built up, not only from ethyl chlorophyllid and phytyl alcohol, but also from xanthophyll and the products of the photo-oxidation of chlorophyll.

Studies on the physico-chemical properties of vegetable saps, III, J. A. HARRIS, R. A. GORTNER, and J. V. LAWRENCE (*Biochem. Bul., 4 (1915), No. 13, pp. 52–79, pl. 1*).—This paper presents a portion of the data obtained in extension of a previous study (E. S. R., 31, p. 427). A comparison has been made of the physico-chemical constants of the juices expressed from the wall with those from the included carpellary whorl in proliferous fruits of *Passiflora gracilis*.

It has been found that specific gravity, concentration, depression of the freezing point, osmotic pressure, electrical conductivity, and mean molecular weight are all susceptible to the influence of the environmental, and possibly to the physiological, state of the plant upon which they are borne.

Fixation of ammonia by cell albumin, T. BOKORNY (*Biol. Centbl., 35 (1915), No. 1, pp. 25–30*).—The author states that his previous conclusions (E. S. R., 29, p. 30) have been confirmed. This supports the view that tobacco smoke causes injury to plants largely through its content of ammonia, which belongs to that class of compounds which are injurious to living protoplasm when present in very small proportions on account of their ready combination with the albuminous components of the cell.

A study of delayed germination in economic seeds, D. H. ROSE (*Bot. Gaz., 59 (1915), No. 6, pp. 425–444, fig. 1*).—This is an attempt to discover some of the problems, with their solutions, having practical interest for seedsmen and growers.

It is stated that hard-coated seeds of legumes and other seeds mentioned germinate more rapidly after being blown against a bank of needle points. Two varieties of lettuce seed improve in viability as they grow older, up to the end of the fourth year at least. This is thought to be due to an increased permeability of the inner seed coat to water.

Cold storage in wet sand increased germination in *Cupressus macrocarpa* and *Pinus strobus* 31 and 32 per cent, respectively. Delayed germination of conifer seeds seems to be due to a lack of water intake, and not to an alkaline or neutral reaction of the embryo.

Certain samples of frosted oats improve in germinating power as they grow older, while others deteriorate. Certain late varieties of garden peas germinate poorly, due to frost injury to the embryo or to the presence of fungi on, in, or within the seed coat. Seed of about one-half of all species and varieties examined showed fungi in relation with the seed coat within two days after being put to germinate.

A bibliography is appended.

The influence of silver nitrate on the germinability of wheat, H. Schroeder (*Biol. Centbl., 35 (1915), No. 1, pp. 8–24, fig. 1*).—The author describes experimentation with barley, rye, and wheat grains treated with 5 per cent silver nitrate for 24 hours. It is stated that the results as regards both quantitative and qualitative germination fully sustain the author's conclusions as previously noted (E. S. R., 24, p. 532), but disagree with those announced by Birckner (E. S. R., 29, p. 629).

The influence of acids, alkalis, and alkali salts on the growth of rice plants, K. Miyake (*Trans. Sapporo Nat. Hist. Soc., 5 (1913), No. 1, pp. 91–95; abs. in Bot. Centbl., 126 (1914), No. 22, p. 588*).—The author has attempted to ascertain how far rice plants are influenced by acids and by alkalis and their salts, by testing for the highest harmless and the lowest fatal concentrations of those compounds. It appears probable from these tests that the sodium ion is more injurious than the potassium, but less so than the hydrogen ion, and that the negative ion of the hydroxids is more injurious than is that of sulphuric or hydrochloric acid, but less so than is the hydrogen ion.

The favorable influence of manganese on the nodule bacteria of legumes, D. Olaru (*Compt. Rend. Acad. Sci. [Paris], 160 (1915), No. 8, pp. 280–283*).—The author has carried out studies suggested by the reports of Bertrand and Javillier (E. S. R., 27, p. 129) regarding the favorable influence of manganese on lower plant forms. Adding small but increasing proportions of manganese sulphate to nutritive media containing nodule bacteria of legumes, he noted an increasing fixation of nitrogen, rising to an apparent maximum in each series.

Radium as a means of forcing growth in plants, H. Molisch (*Naturwissenschaften, 2 (1914), No. 5, pp. 104–106, figs. 3; abs. in Bot. Centbl., 126 (1914), No. 25, p. 665*).—The author's work testing the influence of radium in hastening development of winter buds has been noted previously (E. S. R., 29, p. 131), as has also his work showing that as good results have been effectively and less expensively obtained by means of warm baths (E. S. R., 21, p. 544; 23, p. 40).

Specific action of organic compounds in modifying plant characteristics: Methyl glycocoll versus glycocoll, O. Schreiner and J. J. Skinner (*Bot. Gaz., 59 (1915), No. 6, pp. 445–463, figs. 4*).—In tests described as carried out with wheat plantlets in nutritive solutions it was found that while the addition of glycocoll was generally beneficial to growth, that of methyl glycocoll checked development and produced a peculiar twisting and lateral growth of the top of the plant. This effect was not counteracted by the addition of calcium carbonate.

Toxic action of chemicals and mutation in maize, A. Jungelson (*Compt. Rend. Acad. Sci. [Paris], 160 (1915), No. 15, pp. 481–483*).—The author reports having obtained in the progeny of more or less injured maize seeds, which had been kept in contact for from 1 to 24 hours with a 1 to 2 per cent solution of copper

sulphate and then sprouted, a considerable percentage of abnormalities of several sorts. The control grains mutilated in like manner, but not subjected to the copper solution, showed no case of abnormality. He refers in this connection to the work and views of Blaringhem relative to the continued inheritance of alterations following traumatisms (E. S. R., 19, p. 1128), and raises the question whether the results of contact of sprouting seeds with more or less poisonous media may not have been of importance in the evolution of plant species.

Physiological isolation of types in the genus Xanthium, C. A. Shull (*Bot. Gaz., 59 (1915), No. 6, pp. 474–483, figs. 7*).—The author notes a degree of physiological isolation among three types of Xanthium near Lawrence, Kans. Two of these appear to be *X. pennsylvanicum* and *X. canadense*, respectively, while a third is considered to be a new species which he has named *X. globosum*, deferring the technical description, however, until the limits of variation can be determined for the new species. This appears to breed true and to be the most productive of burs yet known. It is thought possible that *X. canadense* may be the result of a cross between the other two.

The law of temperature connected with the distribution of the marine algæ, W. A. Setchell (*Ann. Missouri Bot. Gard., 2 (1915), No. 1–2, pp. 287–305*).—This is a preliminary discussion of the distribution of marine algæ, with some inquiry into the conditions governing such distribution. One of the most important of these is temperature. The greater part of the species, so far as observed, are found in only one of the temperature zones studied, which are based on a range of 5° C., and a rapidly decreasing number extend to two or more zones.

A list of works referred to is given.

Polymorphism in fungi, L. Daniel (*Trav. Sci. Univ. Rennes, 12 (1913), No. 2, pp. 112–115*).—Commenting on cases observed, the author suggests three hypotheses regarding polymorphism in fungi, (1) that of local or individual forms corresponding to local conditions, (2) sexual hybrids, provided sexuality in higher fungi be admitted, and (3) graft hybrids which are asexual in character.

Convenient methods for demonstrating the biochemical activity of micro-organisms, with special reference to the production and activity of enzyms, C. H. Crabill and H. S. Reed (*Biochem. Bul., 4 (1915), No. 13, pp. 30–44, pl. 1*).—The authors describe methods for making semipermanent demonstrations of the activities of micro-organisms. These methods are designed to show the presence and action of products of cellular activity upon appropriate substances incorporated in layers of agar. Tabulated data are given for the various tests and media employed with groups of organisms.

Evidence for the general distribution of oxidases in plants, G. B. Reed (*Bot. Gaz., 59 (1915), No. 5, pp. 407–409*).—It is held that if oxidases play the essential rôle in respiration attributed to them, they must be present in all living cells.

Regarding the two types of tissues that have been claimed to lack oxidases, the author has already reported (E. S. R., 31, p. 826) studies relating to such as are markedly acid in reaction. As to those said to contain large amounts of reducing substances he now submits results tending to show that oxidases are of general occurrence among the algæ, which has been claimed to be as a group, with but two definite exceptions, free from oxidases on account of the presence of reducing substances.

Oxidation and reduction in relation to vegetable chromogens, J. Wolff and Nadia Rouchelmann (*Compt. Rend. Acad. Sci. [Paris], 160 (1915), No. 22, pp. 716–718*).—One of the authors having noted (E. S. R., 32, p. 129) that

under the oxidizing influence of laccase the chromogen of apple gives rise to a pigment which may be reduced by hydriodic acid, study of this and related phenomena was extended to a number of plants, which are listed according to their readiness or failure of response to tests.

The authors claim to have shown that the phenomena observed in iodin color tests are always preceded by the action of a laccase. In every case where the presence of laccase was demonstrated there were shown to be present substances oxidizable by that enzym, but where chromogens were met with it was not always possible to demonstrate the presence of laccase.

Recent studies regarding the presence of reduction and oxidation regions in plant cells, H. SCHNEIDER (*Ztschr. Wiss. Mikros. u. Mikros. Tech., 31 (1914), No. 4, pp. 478–491*).—This is largely a controversial article.

Plant pigments: Their color and interrelationships, B. HOROWITZ (*Biochem. Bul. 4 (1915), No. 13, pp. 161–172*).—This is a discussion of contributions by various authors bearing upon these topics.

Recent studies on the pigments of chromoleucites, V. LUBIMENKO (*Compt. Rend. Acad. Sci. [Paris], 160 (1915), No. 8, pp. 277–280*).—The author has continued previous investigations (E. S. R., 31, p. 128), and claims the results to show that the pigments associated with chlorophyll undergo alteration, associated with the activity of oxidizing enzyms, during the transformation of chloroleucites into chromoleucites. Examination of the yellow pigments contained in the latter is said to show that all these pigments resolve themselves into two distinct groups, one of carotinoids insoluble in concentrated formic acid, and another of xanthophylloids, which dissolve more or less easily in that acid. The carotinoids form a series of substances which are, as to optical and chemical properties, intermediate between carotin and xanthophyll.

Briefly stated, the evolution of the pigments contained in the chloroleucites in the course of their transformation into chromoleucites results in the formation of substances which are related to carotin, xanthophyll, and their respective isomers, lycopin and rhodoxanthin. The appearance of substances intermediate between these four principal forms, as well as the formation of the latter two (which do not exist in the chloroleucites), may be attributed to the reciprocal chemical processes of oxidation and reduction, the counterbalancing of each of these against the other having as a result the stability apparent in the chlorophyll and accompanying pigments.

Antioxidase of tomato plants, V. LUBIMENKO (*Compt. Rend. Acad. Sci. [Paris], 160 (1915), No. 15, pp. 479–481*).—In order to test the hypothesis resulting from the work above noted, that oxidizing enzyms are the excitants of changes noted during the alterations in the chlorophyll, the author tested tomato fruits during several successive stages of development and ripeness, reaching the conclusion that the tissues of such fruits contain an enzym which opposes the oxidizing tendency of peroxidase. This enzym has been called antioxidase. It is apparently much more sensitive than is peroxidase to the influence of various antiseptics. The quantitative ratios between these two opposed substances in the several tissues vary in ways which are described for different stages of the plant's development.

The experimental modification of germ plasm, D. T. MACDOUGAL (*Ann. Missouri Bot. Gard., 2 (1915), No. 1–2, pp. 253–274, figs. 4*).—This article, which is partly critical, cites also former (E. S. R., 25, p. 327) and recent results of experimentation tending, it is claimed, to prove that the germ plasm is not unalterable.

Recent investigations on the protoplasm of plant cells and its colloidal properties, F. CZAPEK (*Ann. Missouri Bot. Gard., 2 (1915), No. 1-2, pp. 241–252*).—Reviewing critically earlier and recent contributions, the author holds

that living protoplasm must be considered as a colloidal emulsion of lipoids in hydrocolloidal media, the latter containing proteins and mineral salts.

Growth and colloid hydratation in cacti, E. R. LONG (*Bot. Gaz., 59 (1915), No. 6, pp. 491–497, figs. 2*).—It was thought at first that the parallelism noted by Borowikow (E. S. R., 29, p. 420) between growth rate and hydratation might be expressive of a general property of plant colloids. Experiments by the author with *Opuntia blakeana*, however, gave opposite results as regards hydrochloric and malic acids, both of which inhibited growth and hydratation. The discrepancy may have been due in part, it is thought, to the stronger concentrations here employed. The action of alkali (sodium hydrate) upon swellings was not so regular as that of acids, being possibly affected by the varying acidity of the plant itself, which tended to neutralize to a greater or less degree the alkali of the penetrating medium.

In general, growth and swelling in these experiments paralleled rather closely. Nutrient solutions exerted an accelerating effect over that observed in distilled water, and hydrochloric and malic acids an inhibitory one, while the effect of sodium hydroxid was irregular.

The effect of some trivalent and tetravalent cations on permeability, W. J. V. OSTERHOUT (*Bot. Gaz., 59 (1915), No. 6, pp. 464–473, figs. 7*).—In continuation of previous investigations noted (E. S. R., 33, p. 328), the author reports studies on the behavior of the trivalent cations lanthanum, cerium, yttrium, iron, and aluminum, and on the tetravalent cation thorium, in which it was found that they are able to decrease permeability to a marked degree.

Atmometry and the porous cup atmometer, B. E. LIVINGSTON (*Plant World, 18 (1915), Nos. 2, pp. 21–30; 3, pp. 51–74, figs. 8; 4, pp. 95–111; 5, pp. 143–149*).—The author has attempted to put before workers in porous cup atmometry the various matters requiring attention. The discovery, development, and merits of the various forms of atmometer are discussed, as are also the construction and use of the present standardized porous cup atmometer, its restandardization, and interpretation of the data obtained therewith. Reference is made also to the spherical porous cup atmometer used by Tower.

FIELD CROPS.

Division of forage plants.—Summary of results, 1914, M. O. MALTE ET AL. (*Canada Expt. Farms Bul. 84 (1915), pp. 35*).—This bulletin gives results of testing varieties of forage plants at the various experiment farms of Canada in continuation of work previously noted (E. S. R., 32, p. 532). The crops include turnips, mangels, carrots, sugar beets, corn, alfalfa, red clover, timothy, and other grasses. Some of the farms report breeding work with alfalfa, red clover, and timothy.

Green manuring and cover plants, R. W. MUNRO (*Agr. Bul. Fed. Malay States, 3 (1915), No. 8, pp. 299–302*).—Brief notes are given on trials of *Clitoria cajanifolia, Crotolaria striata, Crotolaria quinquifolia, Canavalia ensiformis, Centrosema plumeri, Mimosa pudica, Mucuna* sp., *Tephrosia candida*, and *T. purpurea* as green manure and cover crops. Canavalia and Mucuna are mentioned as being of special value for use in the Federated Malay States.

The improvement of grasses and forage crops (*Rev. Vet. e Zootech., 5 (1915), No. 2, pp. 88–108*).—This gives results of cultural tests at the station at Lages, Brazil, in 1914.

Dry-farming investigations in the United States, L. J. BRIGGS (*Rpt. Brit. Assoc. Adv. Sci., 1914, pp. 263–282, pl. 1, figs. 7*).—A paper reviewing the work of the U. S. Department of Agriculture in dry-farming investigations.

Alfalfa on land not naturally adapted to that crop, J. F. Barker (*New York State Sta. Circ. 39 (1915), pp. 8, pls. 2*).—This gives cultural methods to be followed in the production of alfalfa on noncalcareous soils of New York State.

Migration of reserve material to the seed in barley considered as a factor of productivity, E. S. Beaven (*Abs. in Rpt. Brit. Assoc. Adv. Sci., 1914, pp. 660, 661*).—An abstract of a paper giving results of a study of the ratio of the dry matter accumulated in the seed to the total dry matter of the plant when fully ripe. It is noted that this ratio frequently influenced the production of grain more than any other factor, and that it varies considerably between different varieties of barley, and therefore becomes important in selection.

On the anatomy of the fruit and leaves of Bromus varieties with special reference to the native sorts, B. Szartorisz (*Kisérlet. Közlem., 18 (1915), No. 3, pp. 555–589, figs. 13*).—This gives results of a microscopical study of many new varieties of Bromus. It is noted that the anatomy of the fruit shows remarkably the relation of the varieties to one another, while that of the leaves emphasizes still stronger the ecological relations.

Home-grown seed corn, R. C. Doneghue (*North Dakota Sta. Circ. 8 (1915), pp. 13, figs. 9*).—This circular gives directions for selecting, curing, and testing seed corn grown in North Dakota.

Manuring of maize on Government Experiment Farm, Gwebi, A. G. Holborow (*Rhodesia Agr. Jour., 12 (1915), No. 4, pp. 498–501*).—This notes the profitable use of a complete fertilizer consisting of 35 lbs. of nitrate of soda, 65 lbs. of double superphosphate, and 25 lbs. of sulphate of potash per acre on land that had been in cultivation for two years and planted to corn. Scarcely any increase in yield was obtained where double the above formula was used.

Additional fertilizer experiments at Government Experiment Farm, Gwebi, A. G. Holborow (*Rhodesia Agr. Jour., 12 (1915), No. 4, pp. 502, 503*).—This article notes the superiority of basic slag over double superphosphate in the production of corn in experiments at Gwebi.

Manurial experiments with cotton at Stirling plantation (*Rpt. Dept. Agr. Barbados, 1913–14, pp. 15–21*).—In fertilizer tests with cotton the best results and a net profit of $4.41 were obtained by the use of 30 lbs. of nitrogen as sulphate of ammonia, 60 lbs. of P_2O_5, and 10 lbs. of K_2O per acre.

Linseed as a fiber plant in British East Africa, R. R. Dedonckele (*Dept. Agr. Nairobi [British East Africa], Bul. 1 (1914), pp. 9, pls. 3*).—This describes methods for the cultivation of flax and the production of the fiber as employed by the natives.

Queensland hemp: Its possibilities as an economic forage plant for the Southern States, J. C. Robert (*Mississippi Agr. Col. [Pub.], 1915, Oct. 1, pp. 7, figs. 5*).—The economic value of Queensland hemp (*Sida rhombifolia*) as a forage plant is discussed. Analyses showed water 6.86 per cent, protein 14.63, fat 3.73, nitrogen-free extract 28.8, fiber 38.73, and ash 7.25 per cent. Some of the principal characteristics noted are its rapid and vigorous growth, good growth in shade, long taproot, and drought resistance.

First report on the improvement of indigo in Bihar, A. and G. L. C. Howard (*Agr. Research Inst. Pusa Bul. 51 (1915), pp. 1–20, pl. 1*).—This article describes the method of cultivation and improvement of indigo and gives results of experiments in pollination, selection, and tillage which are summarized as follows:

"The so-called 'disease' of Java indigo, which ends in the wilting of the plant, is due to long-continued wetness of the soil. This wetness leads to the destruction of the young feeding roots, which is followed by leaf-fall and then by the more or less complete wilting of the plant. For a time this wilting can be

checked if the plants are pruned at the first cut so as to leave a branch. Pruning instead of complete cutting back at the first cut leads to an increase in the total crop. After the second cut in an ordinary monsoon indigo ceases to be profitable and should be dug up to make room for rabi crops. The growth of indigo for leaf and for seed should be regarded as separate things and seed should not be raised from the old plants which have been cut for leaf. The best method of obtaining good seed of Java indigo is to sow the crop in lines about 24 in. apart in the middle of August on high-lying, well-drained fields which are in good heart. After gathering the seed the crop can probably be grown on for leaf during the next monsoon. Java indigo is greatly improved and a good many weeds are removed if it is harrowed as soon as possible after the removal of the cover crop. When wheat is grown as a cover crop an early maturing variety with little foliage and stout straw gives the best results."

Second report on the improvement of indigo in Bihar, A. and G. L. C. Howard (*Agr. Research Inst. Pusa Bul. 54 (1915), pp. 11, pl. 1*).—This continues the report of work noted above. In studying the production of indican in the plant there was found to be a close relation between the quantity of nodules on the roots and the content of indican in the leaves of the plant.

"The development and activity of the root nodules of indigo take place best when the plant is grown on somewhat poor land. On such land the soil contains little nitrate, and, accordingly, the nodule factories are working at high pressure to supply the proteids required. Large amounts of the nitrogen and oxygen of the air are used up and the leaves of the indigo become rich in indican. . . . The activity of the root nodules reaches its maximum about the time the plant is ready to flower. At this period the leaves are also rich in indican. At this time, however, the indican in the leaves begins to be called upon by the plant and to be utilized by the flowers and developing seeds."

It is noted that the same plants are not suited for both leaf and seed production. Methods for the production of leaf and of seed are described.

Melilotus indica as a green manure crop in southern California, W. M. Mertz (*California Sta. Circ. 136 (1915), pp. 4*).—This gives the results of cultural tests showing the value of bitter clover as a green manure crop for orchards as well as for field crops.

In studying the effect of turning under a bitter clover crop on the succeeding nonleguminous crop the bitter clover was found to increase the yield 64.8 per cent; common vetch (*Vicia sativa*), 28.7 per cent; bur clover (*Medicago denticulata*), 30.4 per cent; and field pea (*Pisum arvense*), 43.3 per cent over the nonlegume plants used as checks, while following the application of 1,092 lbs. nitrate of soda or 1,188 lbs. dried blood per acre to the nonleguminous crop the increases averaged 45.6 per cent.

The time, rate, and method of seeding and inoculation are discussed.

Oats of the Mediterranean countries, Trabut (*Prog. Agr. et Vit. (Ed. l'Est-Centre), 36 (1915), No. 29, pp. 59–66, figs. 7*).—This article gives the results of a study of the structure and form of the native oats of Algeria and their relation to the cultivated oats of central Europe.

Culture of the potato, J. W. Wellington (*New York State Sta. Circ. 36 (1915), pp. 4*).—This circular gives general directions for the production and storage of potatoes in New York State.

The process of transplanting rice, N. Novelli (*Gior. Risicolt., 5 (1915), No. 17, pp. 273–283, figs. 9*).—This describes in detail the Italian method of transplanting rice.

New varieties of rice (*Agr. Mod. [Milan], 21 (1915), Nos. 2, pp. 21–23; 3, pp. 41–43, figs. 16*).—This gives results of trials in Spain of rice that was imported from Japan. Ten imported varieties are described.

Experiments with rye on sandy soil, B. Schulze (*Mitt. Deut. Landw. Gesell., 30 (1915), No. 37, pp. 544–546*).—The results of testing the value of fall and spring applications of nitrogen show that the best yields and profits were obtained when part of the nitrogen was applied at seeding time in the fall as sulphate of ammonia and part in the early spring as nitrate of soda. Light seeding was found to give more profit than heavy seeding for rye.

Green manuring with sanai in Bihar, A. and G. L. C. Howard (*Agr. Research Inst. Pusa Bul. 51 (1915), pp. 25–27, pl. 1*).—This article gives the results of the use of sanai as a green manure crop for tobacco in 1914, which are summarized as follows:

"The experiments with sanai as a green manure for tobacco in the botanical area at Pusa have led to very definite conclusions. Drainage is essential for success with green manure on the high lands. The sanai should be sown on the early rains in May and plowed in as near July 15 as possible. Where large areas have to be dealt with the period from July 7 to July 21 would be suitable. Any crop left on July 21 should be cut at once, left on the surface, and plowed in as soon as possible. To get the maximum benefit of the green crop the interval between the plowing in of the sanai and the transplanting of the tobacco should be eight weeks. A longer or a shorter time leads to loss."

The economic value of the soy bean, J. C. Robert (*Mississippi Agr. Col. [Pub.], 1915, July 1, pp. 15, figs. 7*).—The author discusses the feeding value, soil fertility value, and general farm economy value of soy beans, and reports chemical analyses of 18 varieties of beans grown in 1913 and 1914. The yields of seed and of hay for five varieties in 1911 ranged as high as 2,600 and 5,500 lbs. per acre, respectively, and in 1912, 2,680 and 5,200 lbs.

A three-year rotation for Mississippi farmers is shown, which consists of hairy vetch, bur clover turned under, and cotton and crimson clover the first year; crimson clover turned under, corn and soy beans, and oats sown in October of the second year; and oats, soy beans, hairy vetch, and bur clover planted in September of the third year.

The use of the soy bean in the Orient and European countries for oil, milk, cheese, casein, bread, biscuits, flour, jellies, cakes, and sauces is noted.

Report of progress in sugar-beet trials for the season of 1914, J. W. Ince (*North Dakota Sta. Bul. 113 (1915), pp. 249–269, figs. 5*).—This bulletin continues the report of work previously noted (E. S. R., 32, p. 435).

The percentage of sugar in the beets ranged in 1914 from 11.7 to 21. With some fluctuations there was shown to be an increase in the sugar content and size of beets on harvest dates from September 28 to October 31.

Meteorological data showing temperature and distribution of rainfall and sunshine for the growing season of 1914 are included.

The variation in sugar content of beets during the first year's growth, O. Munerati, G. Mezzadroli, and T. V. Zapparoli (*Staz. Sper. Agr. Ital., 48 (1915), No. 2, pp. 85–136, figs. 2*).—This gives results of a study of sugar beets grown in 1914, including meteorological data for the season.

The tabulated data for over 1,700 individual beets show the weight of leaves and of roots, percentage of sugar, total sugar, and form of root. These beets were planted on March 31 and harvested on different dates from June 10 to December 12. In some groups the beets were partially defoliated.

The average percentage of sugar for the different groups ranged from 6.62 for those harvested June 10 to 15.8 for those harvested November 9, after which date there was a falling off to 13.55 per cent. The ash content fluctuated from 1.04 per cent on June 10 to 0.85 per cent on December 12. The total nitrogen per beet fluctuated considerably, being highest (157 mg.) on June 27 and

lowest (58 mg.) on October 14. The amid and ammoniacal nitrogen ranged from 24 mg. on June 10 to 76 mg. on June 27, the following harvest, fluctuating between these two figures on succeeding dates until December 12, when it was 30 mg. per beet.

Defoliation tended to reduce the sugar content of the root. No relation was shown to exist between the form of the root and its content of sugar.

The relation of the foliage to the sugar content of beets, L. MALPEAUX (*Vie Agr. et Rurale, 5 (1915), No. 12, pp. 213–216*).—This gives results of a study of the relation of quantity of foliage to the quality of the beets grown from seed planted on dates with an interval of three weeks between, and of a study of the relation of color of the foliage at harvest to the quality of the beets.

The data indicate a direct relation between the sugar content and the development of the foliage, showing less sugar in beets with the fewer leaves, i. e., the late-planted beets. Beets having yellow, mature foliage at the time of harvest showed a lower content of sugar than those having some green leaves. Deep-growing, conical-shaped beets showed a higher content of sugar than the more shallow-growing roots.

Influence of direction of row on the yield of sugar beets, J. K. GREISENEGGER (*Österr. Ungar. Ztschr. Zuckerindus. u. Landw., 44 (1915), No. 1, pp. 14–22, fig. 1*).—It is shown as the result of experiments at Marchfeld, Austria, that rows running east and west yielded 7 per cent more of beets, 71 per cent more of leaves, and 6.4 per cent more of sugar than the rows that ran north and south.

Catalytic elements and fertilizing substances little used in the cultivation of sugar beets, O. MUNERATI, G. MEZZADROLI, and T. V. ZAPPAROLI (*Staz. Sper. Agr. Ital., 47 (1914), No. 11–12, pp. 817–852*).—This continues work previously noted (E. S. R., 31, p. 233). The results seem to indicate only slight, if any, stimulating effects of the substances used, which consisted of different forms of magnesia, manganese, sulphur, and uranium.

Lead nitrate as a catalytic fertilizer for sugar beets, J. K. GREISENEGGER (*Österr. Ungar. Ztschr. Zuckerindus. u. Landw., 44 (1915), No. 2, pp. 91–96*).—The slight fluctuations in the yield and quality of the beets which were noted as results of this experiment could not be attributed to the use of lead nitrate, applied at the rate of 4 and 16 kg. per hectare.

The experimental error in field trials with sugar cane and the effect on this error of various methods of sampling, H. E. ANNETT (*Agr. Research Inst. Pusa Bul. 49 (1915), pp. 18, fig. 1*).—Five methods of sampling sugar cane on $\frac{1}{10}$-acre plats to determine the total weight of cane, average weight of each cane, and total weight, percentage, specific gravity, sucrose content, reducing sugar content, and total sugar content of the juice were tested in 1913.

The results show that "the sample should consist of about 200 canes taken in groups of three from about 70 places throughout the area. These 70 places should be accurately measured out and the three canes nearest to the measured points be taken, provided such canes are canes which would normally be taken by the cultivator for juice extraction. No increase in accuracy seems to be obtained by taking half plat samples. In these experiments the '100 canes' samples seem to have given as good results as any other method of sampling, but samples consisting of only 50 canes are much less reliable."

Paraguayan tobacco, G. T. BERTONI (*Bol. Dept. Nac. Fomento [Paraguay], No. 7 (1914), pp. 5–16, pls. 5*).—This article gives results of a study of the native Paraguayan tobacco, Havana tobacco, and hybrids from crosses of these varieties, including descriptions of types accompanied by drawings showing the distinguishing characteristics.

The improvement of tobacco cultivation in Bihar, A. and G. L. C. Howard (*Agr. Research Inst. Pusa Bul. 50 (1915), pp. 19, pls. 4, fig. 1*).—The authors suggest methods of improvement in producing seedlings, transplanting, field cultivation, manuring, and selection that the growers of Bihar could employ.

Time and method of tillage on the yield and comparative cost of production of wheat in the Palouse region of eastern Washington, C. C. Thom and H. F. Holtz (*Washington Sta. Bul. 123 (1915), pp. 3–8*).—This gives results of a test of two years' rotations indicating a greater profit from continuous cropping with wheat and corn or wheat and field peas than with wheat and summer fallow. With wheat and summer fallow early spring plowing not packed was more profitable than when packed, but late spring plowing was more profitable packed. Early spring plowing was more profitable than late spring plowing, and early spring disking before late spring plowing more profitable than not disking. Fall plowing with late spring disking was more profitable than fall disking with late spring plowing. Wheat and volunteer pasture was the most unprofitable rotation tried.

Varieties of hard spring wheat, C. R. Ball and J. A. Clark (*U. S. Dept. Agr., Farmers' Bul. 680 (1915), pp. 20, figs. 7*).—The authors point out the characteristics of the common and durum wheats grown in the northern Great Plains. Descriptions of durum, Fife, Preston, and bluestem groups are given with varietal names and average yields in different sections. A key to the identification of the groups is included.

Fertility and weeds, J. W. Ince (*North Dakota Sta. Bul. 112 (1915), pp. 233–247, figs. 6*).—This gives results of a study of the composition of weeds and their influence on the soil fertility and crop growth. Figured on a moisture-free basis it is shown that the amount of ash in weeds is very large, ranging from 7.95 per cent to 22.7 per cent, with an average of about 12 per cent. Of the 27 weed samples reported, 24 contained more of the valuable plant food constituents, that is, nitrogen and phosphoric acid, than the average of the four grain crops—wheat, oats, barley, and flax.

In studying field conditions, in nine cases it was found that the average percentage of dry matter in wheat as compared to the total dry matter of wheat and weeds was only 35.5, of flax in flax fields 30.4, of oats in oat fields 53.5, and of barley in barley fields 79.5. It is noted that in a general way these figures are fairly representative of the relative struggle of these crops against weeds.

Statistical data and analyses are given of pigeon grass (*Setaria viridis*), barnyard grass (*Echinochloa crus-galli*), kinghead (marsh elder) (*Iva xanthifolia*), lamb's-quarters (*Chenopodium album*), great ragweed (*Ambrosia trifida*), and rough pigweed (*Amarantus retroflexus*).

Tabular data show analyses of weed and crop samples, comparative yields of weed and crops upon plats 3 ft. square, and the fertility removed by varying quantities of weeds (green weight).

HORTICULTURE.

Market gardening, F. L. Yeaw (*New York: John Wiley & Sons (Inc.), 1915, pp. VI+102, figs. 36*).—A small manual on market gardening. It discusses methods of propagation, preparing the soil, cultivation, harvesting, and marketing of the more common and hardy vegetables. Information is also given relative to soils, fertilizers, moisture requirements, seeds, germination, the preparation and care of hotbeds, etc. A special chapter is devoted to the location, planning, and care of home and school gardens.

The vegetable industry in New York State (*N. Y. Dept. Agr. Bul. 70* (*1915*), *pp. 1209–1575, pls. 3, figs. 136*).—This bulletin comprises a compilation of over 40 articles written by scientists and practical specialists and covering various phases of the vegetable industry in New York State. Accounts are given of market-garden practices in different sections of the State, forcing house methods, the canning industry, the seed industry, cooperative marketing, soils, the importance of vegetables in the dietary, fertilizers, diseases, and insect pests, together with specific directions for growing various vegetables. The bulletin also contains a cultural guide, census statistics on vegetable growing in the State, and a list of reference books for vegetable growers.

The fertilizer problem from the vegetable grower's standpoint, C. E. Durst (*Illinois Sta. Circ. 182* (*1915*), *pp. 3–28, figs. 5*).—This circular comprises a revision of a paper read before the Horticultural Society of Central Illinois, at Peoria, Ill., in November, 1913. It discusses the general principles of plant nutrition and losses of fertility in vegetable growing, including losses by crop removals, drainage and leaching, losses of organic matter and nitrogen by oxidation, methods of checking the losses of fertility, and probable losses of fertility annually. Consideration is then given to methods of supplying fertility to the soil by means of various organic and inorganic manures, as well as to drainage and crop rotation.

Hot and cold frames, J. W. Wellington (*New York State Sta. Circ. 35* (*1915*), *pp. 4*).—This circular contains concise directions for the location and construction and management of hot and cold frames.

The control of insect pests and plant diseases (*New York Cornell Sta. Bul. 283* (*1915*), *rev., pp. 465–500, figs. 43*).—In the present edition of this bulletin (E. S. R., 24, pp. 550, 557) the subject matter has been revised to include more recent practice, and the diseases and insect pests discussed are grouped together under the various crops, which are arranged in alphabetical order.

Fungicide and insecticide inspection (*Maine Sta. Off. Insp. 68* (*1915*), *pp. 29–56*).—This publication presents the results of examinations of preparations for the control of plant insects and diseases, animal parasites, household pests, and miscellaneous fungicides and insecticides in Maine during 1914. A discussion of the law, together with a statement by the executive of the law, A. M. G. Soule, is also included.

[State laws relating to nursery stock in the United States and Canada], G. G. Atwood (*Nat. Nurseryman, 23* (*1915*), *No. 9, pp. 334–339*).—A synopsis of the laws and regulations governing the shipment, inspection, and certification of nursery stock in the United States and Canada.

New garden plants of the year 1914 (*Roy. Bot. Gard. Kew, Bul. Misc. Inform., 1915, App. 3, pp. 57–84*).—This comprises a list of plants, both English and foreign, brought into cultivation for the first time during 1914, together with the most noteworthy plants which have been reintroduced after being lost from cultivation.

[Report of economic section], C. K. Bancroft (*Rpt. Dept. Sci. and Agr. Brit. Guiana, 1913–14, App. 2, pp. 9–10*).—This comprises a progress report on the condition and behavior of various economic plants growing at the Botanic Garden and at Government House Gardens, including a descriptive list of mangoes.

Plant breeding in Canada, W. T. Macoun (*Jour. Heredity, 6* (*1915*), *No. 9, pp. 398–403, fig. 1*).—A popular résumé of the breeding of horticultural plants at the Dominion Experimental Farms with special reference to breeding work with apples.

Protecting pollinated blossoms, W. S. Chapin (*Jour. Heredity, 6* (*1915*), *No. 10, pp. 471, 472, fig. 1*).—The author here describes and illustrates a muslin

tube or bag extended by a frame of wire netting which allows the bag to be put on or taken off the pollinated flower with little danger of injury to the most delicate blossoms.

Inheritance of habit in the common bean, J. B. NORTON (*Amer. Nat., 49 (1915), No. 585, pp. 547–561*).—Data are given on a study of character transmission in some third and fourth generation plants of garden beans. A few second-generation plants of hybrids were also included in the study.

The author concludes from his observations that the plant habit in beans is largely determined by the presence or absence of axial and terminal inflorescence, the length of the axis, and the climbing habit, which is due to a factor for circumnutation. The cause of the various degrees of the climbing habit has not been determined with any degree of certainty. The contorted stems of erect bush forms are probably caused by the factor for circumnutation.

A short bibliography of cited literature is given.

Cantaloup growing in North Carolina, R. G. HILL (*Bul. N. C. Dept. Agr., 36 (1915), No. 8, pp. 23, figs. 10*).—This bulletin embraces the results of experimental trials made with cantaloups on the Pender test farm and of observations on the conditions of culture and marketing of this crop throughout the commercial cantaloup regions of the State.

On the genetics of "rogues" among culinary peas (Pisum sativum), W. BATESON and CAROLINE PELLEW (*Jour. Genetics, 5 (1915), No. 1, pp. 13–36, pls. 6*).—A progress report on a study of the genetic relations of rogues to the typical varieties from which they come.

The authors' experience with three varieties is summarized in brief as follows: Thoroughly typical plants do occasionally throw rogues and certain intermediate forms; the rogues of whatever origin when fertile have offspring exclusively rogues; intermediates raised from types showing combinations of type and rogue characters give mixed families of various compositions; and crosses between types and rogues, however made, have practically always given rogues, though these in their juvenile condition are generally type-like. These rogues have always given only rogues.

Investigations on the culture of Daïkons, MISS TROUARD RIOLLE (*Ann. École Nat. Agr. Grignon, 4 (1913), pp. 24–33, figs. 5*).—A paper on the cultivation of Japanese radishes, based on the author's works with cultivated radishes reported on in full (E. S. R., 33, p. 638).

Distribution of starch in some Chinese radishes, MISS TROUARD RIOLLE (*Ann. École Nat. Agr. Grignon, 4 (1913), pp. 34–37, figs. 3*).—This paper is based on the author's work with radishes, which has been reported on in full (E. S. R., 33, p. 638).

Onion culture, J. W. WELLINGTON (*New York State Sta. Circ. 40 (1915), pp. 6*).—A popular treatise discussing climate, soils, drainage, crop rotation, preparation, fertilizers, propagation, onion sets, seed, treatment of seed, planting, cultivation, thinning, disease and insect troubles, harvesting, storage, types, and selected varieties.

Rhubarb culture, C. C. CARSTENS (*New York State Sta. Circ. 38 (1915), pp. 4*).—A treatise similar to the above.

Culture of sweet corn, J. W. WELLINGTON (*New York State Sta. Circ. 29 (1914), pp. 3*).—A treatise similar to the above.

Sweet corn, A. E. WILKINSON (*New York: Orange Judd Co., 1915, pp. VII+203, figs. 20*).—Part 1 of this work comprises a concise treatise on the culture of sweet corn for home use; part 2 consists of a similar treatise on commercial culture and marketing of green sweet corn; and part 3 deals with the raising of sweet corn for canning, including information relative to the processes of

canning. Consideration is given to the breeding and selecting of seed corn for different purposes.

Heredity of types of inflorescence and fruits in tomato, M. B. CRANE (*Jour. Genetics, 5 (1915), No. 1, pp. 1–11, pls. 7*).—Observations with illustrations are reported on the inheritance of forms of inflorescence, fruit shape, and other characters through the third generation in plants raised from the variety Wonder of Italy crossed with Lister Prolific.

Observations were made relative to the sterility of anthers in some tomatoes. Certain anthers were examined and found to be contabescent and devoid of pollen. Later these plants produced many parthenocarpic fruits. The flowers on an inflorescence of one of these plants were isolated and crossed with the original female parent; the resultant fruits were full of seed and much larger than those without seed. Twenty plants raised from seed of the above cross were all hermaphrodite, the stamens were normal, and they produced fruit freely.

Tomato culture, J. W. WELLINGTON (*New York State Sta. Circ. 34 (1915), pp. 3*).—A treatise similar to the above on tomato culture.

[Lists of fruits for Illinois] (*Trans. Ill. Hort. Soc., n. ser., 48 (1914), pp. 21–23*).—Variety lists are given of orchards and small fruits recommended for planting in northern, central, and southern Illinois.

Apple breeding in Idaho, C. C. VINCENT (*Jour. Heredity, 6 (1915), No. 10, pp. 453–455*).—This paper, read before the American Genetic Association at Berkeley, Cal., on August 5, 1915, comprises a preliminary report on crosses made between different varieties of apples at the Idaho Experiment Station during the five years 1910 to 1915. To date there are 10,915 hybrid seedlings growing in the station orchard and nursery.

Distribution of station apples, U. P. HEDRICK (*New York State Sta. Circ. 28 (1914), pp. 3*).—This circular briefly describes twelve varieties of apples offered for distribution by the station in 1914. The terms of distribution are also given. A fuller description of most of the varieties listed has been published in a previous bulletin of the station (E. S. R., 27, p. 843).

Second distribution of station apples, U. P. HEDRICK (*New York State Sta. Circ. 37 (1915), pp. 2*).—A circular similar to the above described six additional sorts of apples offered for distribution by the station in 1915. Most of these varieties have been described in a previous bulletin (E. S. R., 27, p. 843).

Conditions affecting the health and productiveness of the cranberry, C. L. SHEAR (*Wis. State Cranberry Growers' Assoc. [Proc.], 28 (1914), pp. 25–28*).—A summary of an address given at the meeting of the Wisconsin Cranberry Growers' Association at Mather, Wis., August 11, 1914.

Strawberries, O. M. TAYLOR (*New York State Sta. Circ. 31 (1914), pp. 10*).—A popular treatise on the strawberry with reference to its culture, varieties, starting and management of the plantation, culture in greenhouses and with irrigation, pests and their control, and marketing the crop. A brief bibliography on strawberry culture is included, together with a list of varieties recommended for trial.

Raspberries, blackberries, and dewberries, O. M. TAYLOR (*New York State Sta. Circ. 33 (1915), pp. 10*).—A treatise similar to the above.

Currants, O. M. TAYLOR (*New York State Sta. Circ. 32 (1914), pp. 7*).—A treatise similar to the above.

Serodiagnosis in the determination of different grapes and their affinity with American grape stocks, E. GARINO-CANINA (*Ann. R. Accad. Agr. Torino, 57 (1914), pp. 149–158*).—A preliminary note on a study of the application of serodiagnosis for determining the affinity of stock and scion.

Study on the variation of the principal acids of the juice of the grape during the process of maturity, E. GARINO-CANINA (*Ann. R. Accad. Agr. Torino, 57 (1914), pp. 233–290, figs. 6*).—The experiments here reported in detail included a physical and chemical study of the changes taking place in the juice of different varieties of grapes during maturity and during the formation of wine.

Chemical-analytic investigations on the ripening of grapes and the formation of wine, W. I. BARAGIOLA and C. GODET (*Landw. Jahrb., 47 (1914), No. 2, pp. 249–302, figs. 29*).—The study here reported was conducted with grapes of the Räuschling variety taken from 18-year-old vines growing at the Wädenswil experiment station. The various chemical changes which take place during the ripening of the grapes and during the formation of wine from the grapes are presented in tabular form and discussed. References to cited literature are included.

The native persimmon, W. F. FLETCHER (*U. S. Dept. Agr., Farmers' Bul. 685 (1915), pp. 28, figs. 17*).—An account of the native persimmon with reference to its botanical classification, natural distribution, distinguishing characteristics, possibilities of improvement, present status of development, propagation, cultivation, diseases and insect pests, uses of the persimmon tree, uses of the persimmon fruit, and selected and cultivated named varieties.

Dates of Egypt and the Sudan, S. C. MASON (*U. S. Dept. Agr. Bul. 271 (1915), pp. 40, pls. 16, figs. 9*).—This bulletin contains descriptions of 22 varieties of dates of Egypt and the Sudan comprising most of the commercial dates of those regions, together with several varieties of minor importance not heretofore published. A general descriptive account is given of Nile Valley dates and their climatic environments.

Successful long-distance shipment of citrus pollen, MAUDE KELLERMAN (*Science, n. ser., 42 (1915), No. 1081, pp. 375–377*).—Shipments of citrus pollen were made from Florida to Japan for use in making hybrids in the variety collection of citrus fruits at the Imperial Horticultural Experiment Station at Okitsu, Shidzuoka Ken. The viability of this pollen in 30 per cent cane-sugar solution was tested by Y. Kumagai of the above station. Different methods were used in preparing the pollen for shipment.

The results of the test show conclusively that pollen can be successfully shipped from Florida to Japan and be in a viable condition on arrival four to six weeks after it is gathered. The most promising method for shipping the pollen over long distances appears to be that of drying the anthers in vacuum over sulphuric acid. The vacuum glass tubes were filled with 1 to 2 in. of anthers, covered with half an inch of cotton, exhausted to about 0.5 mm. pressure in the presence of sulphuric acid, and the tube was then sealed. As far as practical the pollen was kept at a temperature of 10° C. until sealed.

Washington navel orange, A. D. SHAMEL (*Jour. Heredity, 6 (1915), No. 10, pp. 435–445, figs. 6*).—A paper read before the American Genetic Association on August 3, 1915, at Berkeley, Cal., in which the author brings together the available information concerning the origin and development of the Washington navel orange. The importance of bud mutations as observed in the author's investigations with navel oranges (E. S. R., 32, p. 439) is also discussed.

Sixty years of tea, coffee, and cacao, J. J. MACFARLANE (*Tea and Coffee Trade Jour., 29 (1915), No. 3, pp. 230–233, figs. 6*).—Charts are given showing the five-year averages of the quantity and value of imports of tea, coffee, and cocoa into the United States, the import price per pound, and the per capita consumption for a period of sixty years from 1851 to 1914.

Experiments at the medicinal plant experiment station of the Agricultural Academy at Klausenburg in 1914, B. PÁTER (*Kisérlet. Közlem., 18 (1915),*

No. 3, pp. 639–658, fig. 1).—A number of cultural, fertilizer, and acclimatization experiments with medicinal plants are reported.

The degeneration of cultivated mints, B. PÁTER (*Kisérlet. Közlem., 18* (*1915*), *No. 3, pp. 625–638, pls. 5*).—Experiments with a number of cultivated mints showed more or less degeneration both in external and internal characteristics. Among the more stable forms were the Hungarian spearmint, which is apparently a variety of *Mentha spicata* generated vegetatively, and the Japanese mint, which appears to be a true variety of *M. arvensis*.

Commercial carnation culture, edited by J. H. DICK (*New York: A. T. DeLaMare Printing & Publishing Co., Ltd., 1915, pp. 262, figs. 80*).—A practical guide to modern methods of growing the American carnation for market purposes. Consideration is given to the following subjects: The carnation family; development of the carnation; profits on carnations; packing, shipping, and business matters; general cultural calendar; sectional cultural treatises; American carnations in Europe; the American carnation as an outdoor bedding plant; the Malmaison carnation; border and annual carnations and pinks; varieties of the American carnation; hybridizing and crossbreeding; exhibiting and judging carnations; best type of greenhouse; heating and fuel; and insects, diseases, and other pests.

The cultivation of the perpetual flowering carnation, C. H. TAUDEVIN (*Cheltenham, England: Young & Co.,* [*1915*], *pp. 24*).—A popular cultural treatise with a monthly calendar of operations.

Double seeding petunias, MYRTLE S. FRANCIS (*Jour. Heredity, 6* (*1915*), *No. 10, pp. 456–461, figs. 3*).—In this paper, read before the American Genetic Association, at Berkeley, Cal., August 6, 1915, the author describes some crossing and selection experiments in which four strains of double petunias that produced seed have been secured from single and imperfect double types.

Humidity, soil, and fertility studies with roses, M. A. BLAKE (*New Jersey Stas. Bul. 277* (*1915*), *pp. 3–55, figs. 7*).—This bulletin discusses the various problems entering into the successful culture of greenhouse roses and describes experiments conducted at the station with Killarney and American Beauty roses. The experiments were started in May and June, 1912, and continued through the 1914 season. Special attention was given to the factor of humidity, since preliminary experiments demonstrated that the failure of these varieties to make proper growth during the winter months was due to the degree of humidity rather than to either plant food, soil, water, or temperature factors.

Observations upon humidity showed considerable variation in different parts of the same greenhouse. Under usual greenhouse conditions humidity decreases with increase of temperature and increases with decrease of temperature. The character of the walks as well as the system of heating and ventilating directly affected the humidity in the greenhouse. It was difficult to maintain a proper degree of humidity in a greenhouse with cement walks, when it was necessary to have all the heat circulating in the pipes. When cinders were placed over the cement walks a higher degree of humidity was maintained.

Lack of sufficient humidity caused American Beauty roses to be checked in growth and the foliage to become hardened and fall from the stem. This resulted in the death of many small roots in the soil. Plants also failed to develop growing shoots at the base when the humidity ranged from 60 to 70 per cent in winter. Under these conditions Pink Killarney was badly affected with mildew, the flower buds were short, quite single in character, and lacked substance. The sepals remained closed about the corolla and the flowers opened quickly on the plant and failed to keep well. When a humidity of 80 per cent was maintained the growth of the roses and the quality of the flowers were greatly improved. High humidity increased the size of the petals but tended to

decrease the color of the flowers by hastening the growth and development. Black spot of the rose appeared to develop very freely when the humidity of the house was low.

Observations made at the station indicate that most varieties of roses do well on the heavy, rich, loam soil, but some varieties, such as My Maryland, may do exceedingly well upon a soil containing a considerable proportion of sand. A light, sandy soil, however, might require too frequent watering to be economical. Directions are given for preparing rose soils, together with suggestions for the use of fertilizers. In the work at the station the following amounts and forms of nitrogen per 100 sq. ft. of bench surface have given good results at various times: Dried blood, 5 to 8 lbs.; dried fish, 7.5 lbs.; cotton-seed meal, 10 lbs.; and nitrate of soda, 4 to 5 lbs. Acid phosphate applied at the rate of 4 lbs. per 100 sq. ft. of bench surface has been sufficient for the needs of the plants and has caused no damage. Potash in the form of sulphate, which is considered the safest to use under greenhouse conditions, has been used at the rate of 12 oz. per 100 sq. ft. The use of lime for the correction of soil acidity was found to be important, although it is not considered an element of plant food. The Killarney rose is very susceptible to injury from soil acidity, while My Maryland is much less susceptible. About 9.5 lbs. of ground limestone per 40 sq. ft. of bench surface proved to be beneficial in experiments recently conducted at the station.

This bulletin also includes a brief discussion of possible losses of plant food in greenhouses, contributed by J. G. Lipman (pp. 43, 44), and suggestions as to the purchase of fertilizers, contributed by C. S. Cathcart (pp. 46, 47).

Rosa hugonis, a new hardy yellow rose from China, D. Fairchild (*Jour. Heredity, 6 (1915), No. 9, pp. 429–432, figs. 2*).—A descriptive account of this Chinese yellow rose, which has been grown in this country less than 15 years. In addition to being one of the earliest blooming roses, it has proven to be perfectly hardy and a prolific bloomer.

Roses and their cultivation, T. W. Sanders (*London: W. H. & L. Collingridge, [1913], 9. ed., pp. 200, pls. 20, figs. 69*).—In the present edition of this work (E. S. R., 15, p. 873) the subject matter has been brought up to date, and the new varieties introduced through the year 1912 have been included.

Saxifrages or rockfoils, W. Irving and R. A. Malby (*London: Headley Bros., [1915], pp. XII+147, pls. 32, figs. 15*).—A descriptive account of the more important members of the saxifrage family with reference to their use in rock gardens. Information is given as to the habitats and cultural requirements of the different species, the class to which they belong, and the hybrids that have been bred from them.

The text is illustrated with photographic reproductions in half-tone and color. Tables of red, yellow, and white colored saxifrages or rockfoils are appended.

List of perennials and shrubs for planting in Illinois (*Trans. Ill. Hort. Soc., n. ser., 48 (1914), pp. 24–35*).—Lists are given of perennial flowers, shrubs, and hardy vines adapted for planting in Illinois, including information relative to method of propagation, relative hardiness, and desirability with reference to foliage, flower, or fruit.

Our mountain garden, Mrs. Theodore Thomas (*New York: E. P. Dutton & Co., 1915, 2. ed., pp. 244, figs. 24*).—A popular account of the author's experience in developing an informal garden, including a list of shrubs, vines, flowers, and weeds cultivated in the garden.

Design in landscape gardening, R. R. Root and C. F. Kelley (*New York: The Century Co., 1914, pp. 12+278, pl. 1, figs. 65*).—This work is based largely upon lectures offered in the department of landscape gardening at the University of Illinois. The introductory chapter discusses the elements of landscape design.

The succeeding chapters deal with design in general, color, planting, different classes of landscape problems, and garden design.

FORESTRY.

The forests of the United States, L. Lundgren (*Engin. Mag., 50 (1915), No. 1, pp. 1–17, figs. 14*).—A popular descriptive account of the forests and forest administration in the United States.

National Forest areas, March 31, 1915 (*U. S. Dept. Agr., Forest Serv., National Forest Areas (1915), pp. 8, fig. 1*).—A tabular statement of National Forest areas revised to March 31, 1915. The total forest area within the National Forest boundaries at this time was 184,611,596 acres, of which 21,337,533 acres belong to private parties. National monuments which have a total area of 1,424,940 acres situated within National Forests have been created under the act of June 8, 1906, for the preservation of objects of historic or scientific interest. In addition some 1,550,048 acres situated wholly or in part within National Forests have been designated as national game preserves under special acts of Congress. Out of 1,187,297.35 acres in the White and Appalachian mountain ranges approved for purchase under the Weeks Law 334,438.03 acres were actually acquired by March 31, 1915.

Handbook for campers in the National Forests in California (*U. S. Dept. Agr., Forest Serv., Handbook for Campers in the National Forests in California (1915), pp. 48, figs. 14*).—This handbook gives an account of the various National Forests in California, including considerable information relative to desirable places to camp, camping outfits, camp fires, cookery, packing, accidents, fires and fire fighting, hints on fire protection, game and fish, etc.

Administration report of the forest circles in the Bombay Presidency, including Sind, for the year 1913–14, with a summary of progress during the five years, 1909–10 to 1913–14 (*Admin. Rpt. Forest Circles Bombay, 1913–14, pp. II+180+4*).—This is the usual report relative to the constitution, management, and administration of the state forests in the Bombay Presidency, including Sind, together with a financial statement for the year. All important data relative to alterations in forest areas, forest settlements, surveys, working plans, fire protection and forest fires, yields in major and minor forest products, revenues, expenditures, etc., are appended in tabular form. A summary of progress during the five years, 1909–10 to 1913–14, is also included.

Report on the forest administration in Burma for the year 1913–14, C. G. Rogers (*Rpt. Forest Admin. Burma, 1913–14, pp. 8+123*).—This is the usual report relative to the administration and management of the state forests of Burma, including a financial statement for the year 1913–14. All important data relative to alterations in forest areas, forest surveys, working plans, forest protection, silvicultural operations, miscellaneous work, yields in major and minor forest products, revenues, expenditures, etc., are appended in tabular form.

The southern cypress, W. R. Mattoon (*U. S. Dept. Agr. Bul. 272 (1915), pp. 74, pls. 12, figs. 7*).—This comprises an account of the southern cypress with reference to its importance, geographical and commercial range, present supply and annual cut, properties of the wood, uses, cypress lumbering, markets and prices, stumpage, life history of the tree, cypress stands, and forest management. Volume and taper tables for cypress are appended.

The jand (Prosopis spicigera) forests of the Punjab, B. O. Coventry (*Indian Forester, 41 (1915), No. 9, pp. 307–315*).—An account is given of this species with reference to its distribution and area, environment, associated species, botany, life history, and economic value.

Hevea rubber cultivation and curing at Non Pareil Estate, Sangre Grande, Trinidad, E. A. ROBINSON and J. W. SARGEANT (*Bul. Dept. Agr. Trinidad and Tobago, 14 (1915), No. 4, pp. 118, 119*).—Tapping experiments conducted with 1,200 6- to 9-year-old Hevea trees for the season of 1914–15 resulted in a yield of 1,608 lbs. of rubber, or a gross return of $147 per acre with the rubber at 50 cts. per pound. The cost of cultivation, manufacture, and sale of this rubber was $86.14, leaving a net profit of $60.86 per acre.

Physiological effects produced on Hevea brasiliensis by various tapping systems, L. E. CAMPBELL (*Dept. Agr. Ceylon Bul. 19 (1915), pp. 27*).—Bulletin 12 of this series (E. S. R., 33, p. 542) gave the yield secured from various systems of tapping. The present bulletin contains the results of examinations of the trees included in the tapping experiments with regard to the relative quantities of reserve food stored in the bark and wood in and at various distances from the tapped areas.

Of six systems of tapping examined, four had an entirely local effect on the reserve food supplies of the trees. In the remaining cases other than local effects were apparent. Reserves of starch had been withdrawn from large regions below the tapped area, and there were also indications that the effects extended even to the roots.

A comparison of different methods of knife tapping and the pricking methods of tapping shows that the effects produced on the local food storage by the pricking methods have been no less drastic than those resulting from ordinary knife cuts. In the majority of cases the effects have been considerably more marked. The untapped bark between the incisions was very poor and sometimes completely deficient in reserve starch. These effects are attributed largely to the formation of wound-wood, which not only required a large amount of reserve material for its formation but also hindered the lateral transference of reserve material across it. With the pricking method of tapping the percentage of scrap in the total yield of rubber was very high.

The effect of different intervals between successive tappings of Hevea brasiliensis, T. PETCH (*Dept. Agr. Ceylon Bul. 20 (1915), pp. 26*).—In connection with tapping experiments of Hevea trees conducted at Henaratgoda (E. S. R., 33, p. 543), observations were made of the effects of tapping at various intervals of from one up to nine days between the tappings.

Although the results are not conclusive they indicate that within limits the yield per tapping increases as the time interval between tappings is increased. The greatest yield in a given time is obtained by tapping at the shortest interval within the limits under experiment. With the longer tapping interval the number of cuts whch it is possible to make to an inch decreases up to an interval of about five days, but this decrease does not nullify the increase in yield per tapping. The yield per unit of bark excised increases as the tapping interval is lengthened, at least up to an interval of about six days. After five years' continuous tapping there is no evidence that the yield obtained in a given time by tapping at an interval of five or seven days will ultimately exceed that obtained by more frequent tapping.

Dynamite experiments, B. BUNTING (*Agr. Bul. Fed. Malay States, 3 (1915), No. 9, pp. 337–341*).—Experiments were conducted at the Castleton Estate, Telok Anson, to test the effect of explosives on the growth of rubber. As measured by the girth increment for one year the control plat gave an average increase in girth of 21.93 per cent, and the dynamite plat an increase of 32.14 per cent for every 100 in. of the original girth.

Summing up the results of various experiments with dynamite conducted by the Department of Agriculture in the Federated Malay States, it appears to be unequaled for breaking up hardpan. It is most effective on heavy clay and

hard laterite soils and least effective on light or loose soils which offer no resistance to the explosion. It is believed that it might be profitable in making holes previous to planting, especially in heavy soils, half a charge of dynamite being sufficient for this purpose. It may be successfully used in breaking up logs and tree stumps previously weakened by termites. The value of dynamite for cultivation is not doubted, but the high cost of the explosive prevents its more general use.

Rubber manuring experiments at the experiment station, Peradeniya, M. K. BAMBER (*Dept. Agr. Ceylon Bul. 18 (1915), pp. 12, pls. 2*).—This bulletin describes manuring experiments with rubber trees started in 1913 and gives the results secured in 1914 with reference to general growth, girth development, and latex and rubber yield. The experiment is to be continued over a series of years.

Preliminary experiments on the effect of temperature control on the yield of products in the destructive distillation of hardwood, R. C. PALMER (*Jour. Indus. and Engin. Chem., 7 (1915), No. 8, pp. 663–669, figs. 3; Chem. Trade Jour., 57 (1915), Nos. 1475, pp. 199, 200; 1476, pp. 223–225*).—Data are given on some preliminary experiments conducted at the Forest Products Laboratory, Madison, Wis., and in a commercial plant at Gladstone, Mich.

In the small scale distillations lowering the temperature of the process and decreasing the speed with which it took place gave marked increases in the yields of alcohol. The laboratory distillations gave 40 per cent more acetate of lime than commercial yields, but the acetic acid was not greatly influenced by variation in the method of distilling. The best results were obtained by slow distillation during the critical stage rather than by lowering the temperature at which the reaction took place. This was accomplished by rapidly removing the moisture content of the wood in the first stages, anticipating the period when destructive distillation or the critical stage began, and at this point decreasing the temperature of the fire.

Forest products of Canada, 1914.—Pulpwood, R. G. LEWIS and W. G. H. BOYCE (*Dept. Int. Canada, Forestry Branch Bul. 54 (1915), pp. 18, pls. 2, figs. 3*).—A report on the production and manufacture of pulpwood and wood pulp in Canada for the calendar year 1914. The report shows the quantity and value of pulp wood produced in the Dominion according to the Province in which it was produced, the kind of wood used, and the method of manufacture; the quantity and value of pulp wood exported from Canada and from the several Provinces in an unmanufactured state; and the value of wood pulp exported from and imported into the Dominion.

A map showing the location of the pulp mills of the Dominion and a diagram representing graphically the quantities of pulp wood used in Canada in the last five years, 1910 to 1914, are included.

DISEASES OF PLANTS.

The relations between scientific botany and phytopathology, O. APPEL (*Ann. Missouri Bot. Gard., 2 (1915), No. 1–2, pp. 275–285*).—In addition to giving a brief review of the development of methodology in combating plant diseases, the author makes a plea for more of the strictly scientific study of plant diseases and their conditions and treatment, as illustrated by that of Münch (E. S. R., 22, p. 152) and of others named.

Phytopathology in the Tropics, JOHANNA WESTERDIJK (*Ann. Missouri Bot. Gard., 2 (1915), No. 1–2, pp. 307–313*).—Giving a brief account of the character and conditions of tropical plant life, the author claims there are comparatively few fungi and bacteria which have been found to cause serious injury in those

regions. The author holds that this is probably due to the peculiar conditions there which influence host and parasite and their mutual relations in ways as yet but little known.

Problems and results in the biological study of fungi, H. KLEBAHN (*Vorträge Gesam. Geb. Bot., Deut. Bot. Gesell., No. 1 (1914), pp. 41, figs. 15*).—This is a bibliographical discussion of certain phases of relation between parasites and parasitized plants as illustrated by examples taken.

Pathological plant anatomy, E. KÜSTER, trans. by FRANCES DORRANCE (*[Dorranceton, Pa.]: Translator, 1913, pps. XIV+258+19*).—This is a mimeographed translation of a book previously noted (E. S. R., 15, p. 373).

A conspectus of bacterial diseases of plants, E. F. SMITH (*Ann. Missouri Bot. Gard., 2 (1915), No. 1–2, pp. 377–401*).—Besides a list of families showing those attacked by one or more bacteria, a discussion is given of the period of greatest susceptibility of the hosts, various influences as related to infection, the incubation period, action and reaction between parasite and host, recovery, extra-vegetal habits of parasites, their prevalence and geographical distribution, and control methods.

Report of the division of plant pathology and bacteriology, H. R. FULTON (*North Carolina Sta. Bien. Rpt. 1913–14, pp. 32, 33*).—This is a brief account of various lines of investigations carried on by the department. In connection with the plant-disease survey, the chestnut blight fungus was found in a nursery in Guilford County in June, 1912. The infected trees were destroyed, and it is believed that the disease is temporarily under control.

Notes on some fungus diseases, E. S. SALMON and H. WORMALD (*Jour. Southeast. Agr. Col. Wye, No. 22 (1913), pp. 450–456, pls. 2, figs. 2*).—A further discussion is given of a disease of apple buds previously noted (E. S. R., 30, p. 352), which attacks several varieties named in varying degrees, and perhaps other fruits as well as berries. The casual organism has not yet been identified.

It is thought probable that the sowing of celery seed bearing *Septoria petroselini apii* may be the principal means by which celery blight is distributed. It is recommended that infected seedlings be dipped in Bordeaux mixture when transplanting them. A number of commercial samples of celery seed have been found to be badly infected.

White root rot (*Dematophora necatrix, Rosellinia necatrix*) was noted as persisting on apple and gooseberry on ground where cherry trees had previously stood.

It is stated that *Mycosphærella brassicicola*, considered to be the perfect stage of a conidial form, *Phyllosticta brassicæ*, causing a leaf spot on certain crucifers, has been found in the Mycosphærella stage showing mature ascospores on leaves of cabbage and broccoli.

Report of the imperial mycologist, F. J. F. SHAW (*Rpt. Agr. Research Inst. and Col. Pusa, 1913–14, pp. 48–61*).—The main portion of this report relates to diseases of plants.

The most important enemy of rice (*Tylenchus angustus*) is active here from July to December, culminating in September or October. It has been known to withstand desiccation for 15 months. Transplanted rice is comparatively immune to natural attack. Burning the stubble may be the best means of protection. *Sclerotium oryzæ* has been found to attack rice in Burma, Madras, Bihar, and Orissa.

Colletotrichum falcatum, causing red rot of sugar cane, is successfully resisted by a hybrid between a local cane and foreign varieties of greater size and yield. A disease somewhat similar as to symptoms and mode of control is due to *Cephalosporium sacchari*. A collar rot is ascribed to *Hendersonina sacchari* and a disease caused by *Helminthosporium sacchari* which produces but

little damage. Smut (*Ustilago sacchari*) is under investigation. Sereh was reported at Jorhat.

An outbreak of fatal bud rot of coconut palms at Malabar, ascribed at first to *Pythium palmivorum*, was finally assigned to the genus Phytophthora. A collar rot of areca palms may be due to *Fomes lucidus*.

Rhizoctonia napi, not previously observed in India, was noted on the Pusa Farm, living chiefly on mustard, but being apparently almost omnivorous. *R. destruens* (also noted on Delphinium) caused a rot of potato, on which *R. solani* was also common. A disease of poppy, associated with Rhizoctonia or with *Peronospora arborescens*, is ascribed to lack of rotation as its chief cause.

A cotton wilt of wide distribution was definitely shown to be a species distinct from *Fusarium vasinfectum*, causing cotton wilt in the United States. It is also less virulent, being unable to attack the Indian cotton known as "buri," which offers the only present hope of escape from loss by this fungus.

A different and (in artificial inoculation) more virulent species of Fusarium causes a wilt of sesame. No resistant variety is known, but the cold weather crop is less subject to the disease than are the monsoon varieties.

Potato blight (*Phytophthora infestans*) does not survive the heat of the plains, but may possibly become a serious pest in the hills. A Phytophthora, discovered to attack Vinca and Petunia, is probably a variety of *P. parasitica*, which attacks castor beans.

The perfect stage of Colletotrichum, causing anthracnose of the betel vine, has been discovered to be an Ascomycetes, and the Colletotrichum and Glœosporium on chili has been proved to be one and the same fungus. The disease appears to be transmitted through the seeds.

Introduction and acclimatization of new varieties of peanut has caused recently a large degree of recovery in returns of this crop, which has been diminished by the tikka disease.

The hot-water treatment proved useless against smut of Pearl millet. The success of the formalin treatment was demonstrated on several estates.

Tylenchus similis, the cause of a root disease of sugar cane and banana, N. A. COBB (*U. S. Dept. Agr., Jour. Agr. Research, 4 (1915), No. 6, pp. 561–568, figs. 2*).—The author describes a disease of bananas which first made its appearance in Fiji in 1890–91, and which was attributed to the nematode *T. similis*. Then only the male nematodes were observed. In 1907 a disease of sugar cane in Hawaii was investigated in which both sexes of the nematode were recognized, and which at that time was described as *T. biformis*. Later investigations have shown the same disease appearing on bananas in Jamaica.

A critical study has proved that the two species are identical, and a technical description of the nematode is given.

Plant diseases and pests (*Bul. Dept. Agr. Trinidad and Tobago, 14 (1915), No. 2, p. 62*).—A statement by J. B. Rorer is quoted, noting good results from preliminary spraying experiments with cacao, coconuts, and cassava.

Heat as protection against insects and cryptogamic parasites of cultivated plants, L. SEMICHON (*Compt. Rend. Acad. Sci. [Paris], 160 (1915), No. 17, pp. 569–571*).—It is claimed, as the result of tests, that water at temperatures of 55 to 65° will destroy not only insect parasites mentioned and their eggs but also fungus plant parasites which have either mycelium or reproductive bodies exposed externally. Water at these temperatures also possesses considerable spreading and adherent qualities, these statements applying in cases of Oïdium on grape or quince, rose mildew, Peronospora of grape, and Phytophthora of potato and tomato. In the treatment of grape mildew it permits the reduction of the copper constituent as well as of the number of treatments.

Uspulun as a fungicide, L. HILTNER and G. GENTNER (*Prakt. Bl. Pflanzenbau u. Schutz, n. ser., 13 (1915), No. 3, pp. 32–40*).—It is stated that tests comparing Upsulun with corrosive sublimate solution for steeping seed grains did not show any injury to the seed as due to the former, but that its fungicidal value was less than that of corrosive sublimate at the strengths employed, namely, 0.25, 0.5, and 1 per cent.

Note on lime and sulphur, D. R. EDWARDES-KER (*Jour. Southeast. Agr. Col. Wye, No. 22 (1913), pp. 368–370*).—From experiments described with lime and sulphur mixed intimately for use as a fungicide, it is concluded that there is no chemical action on mixing either quicklime or slaked lime with flowers of sulphur. Consequently, considered from a chemical point of view, there is no obvious advantage in adding lime to this form of sulphur when designed for use as a fungicide.

The Penicillium luteum purpurogenum group, C. THOM (*Mycologia, 7 (1915), No. 3, pp. 134–142, fig. 1*).—In further development of work previously noted (E. S. R., 22, p. 531), the author discusses different phases of the series, at one end of which stands a strain of *P. luteum* producing ascospores freely and conidia sparingly, and at the other end *P. purpurogenum* producing conidia only. He concludes the article with a synoptical arrangement of the strains considered.

The wintering-over of yellow rust and the occurrence of rust years, L. HECKE (*Naturw. Ztschr. Forst u. Landw., 13 (1915), No. 4–5, pp. 213–220*).—Studies previously reported (E. S. R., 24, p. 743) have been followed up by observations tending to show, it is claimed, that under certain conditions the overwintering of the mycelium of yellow rust may be of considerable importance.

The carrying over of the rust by wild plants is discussed, the author mentioning the yet unpublished work of K. Barfuss, who is said to have found that the yellow rust of wheat may infect *Dactylis glomerata*, also *Kœleria cristata* and *Lolium temulentum*. These results tend to contradict the views of a supposedly sharp specialization by this rust and establish also the fact that this fungus can attack rye and barley when wounded and that it may, after cultivation during several generations, attack the former even when uninjured.

Meteorological factors appear to be important, all conditions favorable to the overwintering of the host apparently favoring the parasite also.

The cereal rusts, W. P. FRASER (*Ann. Rpt. Quebec Soc. Protec. Plants* [*etc.*], *7 (1914–15), pp. 116–120*).—This is a somewhat general discussion of rusts chiefly as known to occur in Canada on wheat, oats, barley, rye, and corn. The use of early or resistant varieties, with destruction of buckthorn and barberry, affords a measure of protection.

Cereal smut control, and yield, E. JORDI (*Jarhresber. Landw. Schule Rütti, 1912–1914, pp. 161–165*).—It is stated, as the result of tests carried on during several years and in part previously reported (E. S. R., 24, p. 345), that as used for smut of wheat, formalin at 0.2 per cent is more effective than copper sulphate at 0.5 per cent strength, but that it is also probably more injurious to germinability.

Rusted seed wheat showed in 1913 a lowering of yield, reaching 26 per cent as compared with the yield from sound grain.

Fungus diseases of cassava, J. B. RORER (*Bul. Dept. Agr. Trinidad and Tobago, 14 (1915), No. 2, pp. 36–38; abs. in Agr. News* [*Barbados*], *14 (1915), No. 341, p. 174*).—The comparative freedom of cassava from disease in Trinidad is ascribed largely to the casual and discontinuous character of its cultivation there hitherto, a condition which is now rapidly disappearing. The only diseases mentioned as serious at this time are leaf spot affections, as described.

A disease of the peanut caused by Bacterium solanacearum, H. R. FULTON and J. R. WINSTON (*North Carolina Sta. Bien. Rpt. 1913–14, pp. 43–47, figs. 4*).—In August, 1912, peanuts of the Spanish variety were observed in Granville County, N. C., as badly diseased, in some cases 15 per cent of the plants being affected. Examination showed that they were infected with *B. solanacearum*, the same species as that causing Granville wilt of tobacco.

Since the peanut has been proved susceptible to attacks of this organism, attention is called to the fact that it can no longer be recommended for use in crop rotation.

Fungus parasites of the pigeon pea, E. RANGEL (*Bol. Agr. [Sao Paulo], 16. ser., No. 2 (1915), pp. 145–156, figs. 3*).—Descriptions are given of the following new species of fungi found parasitic on pigeon peas in Brazil: *Vellosiella cajani* (*Cercospora cajani*), *C. instabilis*, *Colletotrichum cajani*, *Phyllosticta cajani*, and *Phoma cajani*. The first mentioned is a new genus and species based on *Cercospora cajani* described by Hennings in 1902.

Infection experiments with the potato blight fungus, G. SMITH (*Jour. Southeast. Agr. Col. Wye, No. 22 (1913), pp. 494–496*).—The author claims to have shown that spores of *Phytophthora infestans*, which freely attack *Solanum aviculare* in Australia, are also able to infect this species in England without a process of gradual adaptation, but he reports that it did not infect tomato, *S. dulcamara*, or *S. nigrum*.

A biochemical study of the root rot of sugar beet, J. BODNÁR (*Bot. Közlem. [Budapest], 13 (1914), No. 4, pp. 114, 115; abs. in Bot. Centbl., 126 (1914), No. 24, p. 644*).—Sugar beets showing root rot gave less cane sugar and water but a larger content of invert sugar, ash, aluminum, and acid than sound roots.

Invertase could be demonstrated in the diseased but not in the sound beets, this fact being correlated with the degree of vitality of the bacteria in the diseased roots.

Sereh in relation to sugar production, F. B. FELLINGA (*Arch. Suikerindus. Nederland. Indië, 23 (1915), No. 3, pp. 71–84*).—It is stated that the degenerative disease of sugar cane known locally as sereh is becoming more and more prevalent in Java, affecting the more productive and common native cane by lowering both the quality and quantity of the sap output. The disease is said to agree with type No. 4 of those described by Wakker and Went (E. S. R., 10, p. 56).

Selection of productive stock absolutely free from sereh and maintenance of the most favorable cultural conditions are deemed imperative.

The comparative susceptibility of varieties of swedes and turnips to the swede mildew (Erysiphe polygoni), G. O. SEARLE (*Jour. Southeast. Agr. Col. Wye, No. 22 (1913), pp. 487–493*).—Results are tabulated for tests in the summer of 1913 with each of 34 varieties of swedes, 41 of turnips, and 2 of rape from seed obtained from five well-known seed merchants in England and Scotland. Every plat was attacked to a greater or less extent, the swedes and rape more severely in general than were the turnips. Crop results are also indicated.

Chlorosis of plants with special reference to calico of tobacco, G. P. CLINTON (*Connecticut State Sta. Rpt. 1914, pt. 6, pp. 357–424, pls. 8*).—After a discussion of chlorosis in plants and the various theories regarding its cause, the author gives brief descriptions and results of nearly 300 experiments conducted during the years 1906 to 1914, inclusive, to determine the nature and control of the mosaic or calico disease of tobacco.

As a result of the investigations, it is claimed that calico of tobacco is primarily a disease of the chlorophyll of the infected plants. It is infectious, and, to a certain extent, contagious. It can be communicated to the leaves through

the roots, but more commonly by contact, as in handling plants, etc. The disease is carried by seed to a limited extent, insects may spread it, but infected plants in the seed bed are believed to be the primary source of the trouble. The genuine disease is not developed by pruning if it is not already present or introduced during the pruning process.

Calico is said to require 10 to 14 days after infection before the disease becomes apparent. The extent of development depends on the age of the plant at the time of infection, mature leaves not being visibly infected, although they may serve as carriers of infection to younger ones.

A similar disease of tomatoes is recognized, and it was found possible to reciprocately inoculate tomatoes and tobacco, causing the characteristic appearance of the disease. Other species of Nicotiana were successfully inoculated, as were a number of other solanaceous plants, but not of plants belonging to other plant families.

The "virus" is said to be renewed within the tissues of the plant, is destroyed by heat, is filterable, can be extracted with alcohol, ether, and chloroform, and retains its vitality for some time in the presence of toluol. The author considers the "virus" as being of the nature of an enzym, and the experiments are believed to suggest that it belongs to the group of oxidizing enzyms.

Bacteria are not considered as causing the trouble here described.

Suggestions for the control of the disease in the seed bed and field are given.

A bibliography of some of the more important contributions to the subject of plant chlorosis is given, in which brief abstracts of the subject matter are included.

New tomato diseases, R. RAPAICS (*Abs. in Bot. Centbl., 126 (1914), No. 23, p. 625*).—The author reports, at Debreczen, *Fusarium erubescens* as causing a dangerous disease of ripe or unripe tomato fruits, *Colletotrichum lycopersici* as causing anthracnose in mild form on the unripe fruits, and *Septoria lycopersici* on the leaves.

Note on Rhizopus nigricans, H. WORMALD (*Jour. Southeast. Agr. Col. Wye, No. 22 (1913), pp. 483–486, fig. 1*).—Study of the organism causing a rot of tomatoes showed by comparative tests that the strain from Kensington and that from Wye are to be regarded as plus and minus, respectively.

Watermelon wilt spread by contaminated seed, H. R. FULTON and J. R. WINSTON (*North Carolina Sta. Bien. Rpt. 1913–14, pp. 48–51, fig. 1*).—Attention was called in August, 1912, to a destructive melon disease due to *Fusarium niveum*. Observations indicate that, while the disease was widespread, it seemed to be associated with one lot of seed as the source of infection. Seed of this lot were procured, and upon germination, showed the presence of the fungus *F. niveum*. Pure cultures were obtained and the disease readily produced by inoculation experiments.

When infected seed were disinfected no disease appeared on germination, indicating that the seed were only externally affected. Some experiments in disinfecting seed were carried on which indicate that soaking seed for 30 minutes in 0.5 per cent solution of formaldehyde not only increased the germination of the seed, but also greatly reduced the infection.

Wood decay in orchard trees, W. T. HORNE (*California Sta. Circ. 137 (1915), pp. 13, figs. 2*).—Attention is called to the frequent occurrence of rots affecting orchard trees, in some instances apple and stone fruit trees being seriously attacked. The decay is said to be due to wood-destroying fungi, and serious losses have been reported from a number of localities in California.

The author recommends cutting out, disinfecting, and coating the wounds with asphaltum. The trees should be inspected at the end of the summer and the disinfection renewed if necessary.

Trichoseptoria fructigena on quince and apple, W. Pietsch (*Landw. Jahrb., 47 (1914), No. 2, pp. 303–323, figs. 13*).—The author, reporting a continuance of previous studies (E. S. R., 29, p. 247), states that irregular flecks on quince leaves showed pycnidia and spores resembling closely those on the fruit ascribed to *T. fructigena.*

Results of culture studies on sterile substrata and on living fruits are detailed. The Japanese quince is apparently not attacked, but the ordinary quince is more susceptible than apple. Apparently the spores survive even hard winters, the period between October and March being favorable to the spread of the organism. The fungus appears to be common on fruits of haw, from which it appparently passes to quince, and from this to apples in storage. This suggests early gathering of the quince crop and careful disinfection of hands, baskets, etc., before handling the apples.

The cedar rust disease of apples caused by Gymnosporangium juniperi-virginianæ, H. S. Reed and C. H. Crabill (*Virginia Sta. Tech. Bul. 9 (1915), pp. 3–106, figs. 23*).—A detailed account is given of the biology of the fungus causing a rust on apple foliage and fruit, and the effect produced on each host plant is discussed. The investigations on which this report is based have been in progress since 1910, some data regarding control measures having been previously issued (E. S. R., 30, p. 450).

In the present bulletin, accounts are given of investigations on the spring development of the fungus on the cedar, its development on apple foliage and fruit, the sporophytic and gametophytic generations of the fungus, chemical studies of diseased and healthy leaves, influence of the fungus on the transpiration, photosynthesis, and respiration of apple leaves, and a summary of experiments for the control of the rust on apple foliage.

The authors found individual variation regarding susceptibility of cedar trees to attacks of the fungus, which was also shown by varieties of apples. Of the apple foliage, only young leaves are susceptible, and infection takes place only in the presence of abundant moisture. The transpiration of affected apple trees was found to be almost constant, whether in light or in darkness, due probably to the stomata becoming unresponsive to light stimulus. Photosynthesis was reduced and respiration increased in diseased leaves. Chemical analysis showed a decrease in total sugars, invert sugar, and starch, and an increase of sucrose in the rusted leaves.

Discussing means of control, the authors conclude that the application of fungicides has not proved to be a practical method of controlling the disease when red cedar trees are present in the neighborhood of apple orchards. In such cases, permanent relief can be obtained by the removal of all red cedar trees in the vicinity.

A bibliography is appended.

Apple leaf spot or black rot canker, P. I. Bryce (*Ann. Rpt. Quebec Soc. Protec. Plants* [*etc.*], *7 (1914–15), pp. 86–90, figs. 3*).—This disease (*Sphæropsis malorum*) has been noted at Sainte Annes in two forms, the frog-eye spots on the leaves and the canker on limbs and growing or stored fruit, several varieties being attacked.

Maintenance of the trees at full vigor is recommended as a general treatment for the trees and the growing fruit. Temperatures below 40° F. reduce or prevent black rot in stored fruit.

Apricot gummosis and sour sap, L. H. Day (*Mo. Bul. Com. Hort. Cal., 4 (1915), No. 7, pp. 330–332*).—Observations and tests as noted have led to the view that many gumming and sour sap conditions of the apricot tree which are common in the coast regions of California are caused by fungi or bacteria which

obtain entrance at points of injury due to various causes. Cutting out and disinfecting the diseased area, where this is not too extensive, has proved successful.

Blight resistant pear stocks, G. COMPERE (*Mo. Bul. Com. Hort. Cal., 4 (1915), No. 7, pp. 313, 314, figs. 2*).—Referring to a report by Reimer (E. S. R., 33, p. 53), the author states that a tree grown from seed of a Chinese wild pear sent over by himself in 1908 is producing fruit and is not attacked by either the pear blight or the woolly aphis, both of which attack severely contiguous trees grown on common stock.

Wilting of raspberry and loganberry canes, H. WORMALD (*Jour. Southeast. Agr. Col. Wye, No. 22 (1913), pp. 474–482, pls. 3, figs. 4*).—A descriptive discussion is given of four fungi found in wilted canes examined, namely, *Hendersonia rubi, Didymella applanata, Coniothyrium fuckelii,* and *Gnomonia rubi.* A Fusarium has been noted as possibly parasitic on the roots of raspberry. It is considered to be the conidial stage of *Nectria rubi.*

Withertip of coffee (*Mem. Fomento [Costa Rica], 1913, pp. 380, 381*).—A partial or total drying up of twigs in exposed parts of coffee trees is noted as causing losses in portions of Costa Rica. Causes assigned by several writers include various fungi named, cold dry winds, and unfavorable physiological conditions.

Heterodera radicicola, G. BONDAR (*Bol. Agr. [Sao Paulo], 16. ser., No. 4 (1915), pp. 329, 330*).—Observations made by the author are cited in support of the view that *H. radicicola* does not attack coffee trees under normal conditions.

Red rust of tea, C. BERNARD (*Dept. Landb., Nijv. en Handel [Dutch East Indies], Meded. Proefstat. Thee, No. 32 (1914), pp. 1–20*).—This discussion appears to be preliminary to a somewhat fundamental study of red rust of tea plants, said to be increasingly injurious recently in Java.

The disease is due to *Cephaleuros virescens,* long known in this region as readily attacking tea plants subjected to unfavorable conditions, some of which are here discussed. Fungicides appear to be relatively ineffective in controlling this trouble.

The control of koleroga of the areca palm, L. C. COLEMAN (*Agr. Jour. India, 10 (1915), No. 2, pp. 129–136*).—This is a brief account of the work now in progress in connection with the koleroga disease of areca palm due to *Phytophthora omnivora arecæ,* in relation to the conditions peculiar to the region indicated, within which this disease is prevalent.

The fungicide used was Bordeaux mixture of double strength, to which had been added an adhesive mixture of resin dissolved by heating with soda in water. The finished mixture showed remarkable adhesive qualities considering the torrential rains prevailing there during part of the year. A special type of spray adapted to the nature of the work has been employed. These protective measures are being widely tested out.

Experiments are now in progress with a view to stamping out the disease entirely, and one area where the rainfall is about 300 in. annually has been kept clear during the past three years.

A disease of coconut in New Caledonia, R. H. COMPTON and P. D. MONTAGUE (*Rev. Agr. Nouvelle-Calédonie, No. 44 (1914), pp. 29–33*).—A brief preliminary discussion is given of a disease affecting flowers, leaves, fruit, trunk, and roots of coconut in New Caledonia. The cause is said to be a fungus, the identity of which has not yet been settled. In its vegetative phase it ramifies widely in the tissues, the fructifications forming externally and producing a vast number of spores. Infection may occur by means of these or by contact of sound with diseased tissue. Sanitary measures are suggested.

Coconut disease in New Hebrides, M. J. KOWALSKI (*Rev. Agr. Nouvelle-Calédonie, No. 44 (1914), pp. 56–59*).—Leaf disease of coconut, ascribed to *Pestallozia palmarum*, is described as causing considerable loss in connection with young trees. A cacao leaf disease of undetermined cause is reported, also a scale insect of coffee trees, which may be the same as that which attacks coffee in Madagascar.

Melaxuma of the English walnut, H. S. FAWCETT (*Mo. Bul. Com. Hort. Cal., 4 (1915), No. 7, pp. 293–297, figs. 2*).—A description is given of melaxuma, a disease causing black cankers and exudation of black sap on the large limbs and trunks of English walnut trees. This has become of considerable importance in Santa Barbara County, California, within the past three years, and has been found in other counties named.

The disease is infectious, being caused by a species of Dothiorella which also attacks a willow common in this vicinity, poles of which are often used to prop the lower limbs of the walnut trees. If not too far advanced, it may be controlled by cutting out the cankers and dead limbs and treating the wounds with strong lime sulphur or with Bordeaux paste, directions for the preparation and use of which are given.

Canker of Pelargonium, W. MAGNUS (*Gartenflora, 64 (1915), No. 5–6, pp. 66–68, figs. 2*).—Brief mention is made of the production of tumorous growths on Pelargonium, apparently similar to those frequently observed to form spontaneously, by inoculation with bacteria said to be also pathogenic to animals, including human beings.

The effect of continued desiccation on the expulsion of ascospores of Endothia parasitica, F. D. HEALD and R. A. STUDHALTER (*Mycologia, 7 (1915), No. 3, pp. 126–130*).—Tests described are said to show that while continued desiccation does not prevent the expulsion of spores by the perithecia of *E. parasitica* when resubjected to favorable conditions of temperature and moisture, it does lengthen the period from the beginning of favorable conditions to the first expulsion, so that perithecial material which has been dried for three months or more would rarely, if ever under natural conditions, discharge spores. Material dried for one or two months might be a source of danger.

Spores from desiccated perithecia showed little or no reduction in germinability. Apparently, also, the time limit of ability to expel ascospores was not reached in the longest period (11 months and 18 days) here employed.

Tests on the durability of greenheart, C. J. HUMPHREY (*Mycologia, 7 (1915), No. 4, pp. 204–209, pl. 1*).—Tests of *Nectandra rodiæi* are described as carried out with various wood-destroying fungi under favorable conditions. Heartwood proved highly resistant, and in most cases practically immune, to all the fungi used, very little effect being visible. The sapwood proved immune to only 3 of the 23 fungi employed. *Lenzites sepiaria* caused a loss in dry weight of 37 per cent in one year, *Merulius lacrymans* 26 per cent, and the losses caused by 6 other fungi ranged from 10 to 25 per cent.

Observations on Herpotrichia nigra and associated species, F. J. SEAVER (*Mycologia, 7 (1915), No. 4, pp. 210, 211*).—The author reports that spores of a fungus found on Picea with *H. nigra* and *Neopeckia coulteri*, and at first thought to be those of an undescribed species of Herpotrichia, were found to be those of a Mytilidion closely related to or identical with *M. fusisporum* and frequently associated with *H. nigra* on conifers. The Mytilidion has also been found associated with *N. coulteri* on pine needles.

Some observations on sycamore blight and accompanying fungi, J. P. ANDERSON (*Proc. Iowa Acad. Sci., 21 (1914), pp. 109–114, pls. 2*).—A brief account is given of the partial investigation of sycamore blight (*Gnomonia*

veneta) said to exist in four conidial forms, known by other names, an ascigerous stage developing in late winter or in very early spring on leaves kept over winter. Notes are also given on three other fungi commonly found on twigs killed by the blight.

A disease of plantation rubber caused by Ustulina zonata, F. T. BROOKS (*New Phytol., 14 (1915), No. 4-5, pp. 152-164, figs. 6*).—The author describes a collar and root disease attacking rubber trees five years old and upward, said not to have been noted before 1914 in Malaya, and ascribed to *U. zonata*.

Field and laboratory studies are described. The trouble is said to be readily distinguishable from the root diseases caused by *Fomes semitostus* (*F. lignosus*), *Sphærostilbe repens*, and *Hymenochæte noxia*. The fructifications, which form grayish and brown or blackish plates, are found in the collar or on the exposed lateral roots. The fungus probably often begins its growth on decaying stumps or follows attacks of white ants.

The removal of all discolored tissues is considered important.

Diseases of Manihot glaziovii, P. ARENS (In *International Rubber Congres met Tentoonstelling, Batavia, 1914.—Rubber Recueil. Amsterdam: J. H. de Bussy [1915], pp. 140, 141*).—A description is given of the disease of *M. glaziovii* in Java due to *Fomes semitostus*, and another disease ascribed to the improper removal of the outer bark before tapping, which leads to decay and insect attack.

Diseases of Hevea brasiliensis in Java, A. A. L. RUTGERS anl P. ARENS (In *International Rubber Congres met Tentoonstelling, Batavia, 1914.—Rubber Recueil. Amsterdam: J. H. de Bussy [1915], pp. 130-139, figs. 4*).—Notes are given on the principal fungus diseases that have been observed on *H. brasiliensis* in Java.

The fungus diseases of Hevea brasiliensis, T. PETCH (In *International Rubber Congres met Tentoonstelling, Batavia, 1914.—Rubber Recueil. Amsterdam: J. H. de Bussy [1915], pp. 116-129*).—Compiled data are given relating to the fungus diseases observed on the leaves, stems, and roots of *H. brasiliensis* in Ceylon, with suggestions for their control so far as definite means are known. No new diseases are reported and the general situation is considered satisfactory.

Root diseases in Malaya (*Agr. News [Barbados], 14 (1915), No. 341, pp. 174, 175*).—This is a brief notice of the two root diseases of Hevea reported by Brooks (E. S. R., 33, pp. 150, 449) as due to *Ustulina zonata* and *Sphærostilbe repens*, respectively.

ECONOMIC ZOOLOGY—ENTOMOLOGY.

A history of British mammals, G. E. H. BARRETT-HAMILTON (*London: Gurney & Jackson, 1914, vol. 2, pts. 15, pp. 3+409-456, pls. 3, figs. 10; 16, pp. 457-504, pls. 4, figs. 9*).—A continuation of the Muridæ, or mice and rats, of the Rodentia, previously noted (E. S. R., 31, p. 248).

It is announced that owing to the death of the late author the work, commencing with Part 16, will be completed by M. A. C. Hinton.

The prairie dog and its control, M. H. SWENK (*Nebraska Sta. Bul. 154 (1915), pp. 5-38, figs. 4*).—A general account of the prairie dog of the plains (*Cynomys ludovicianus*) is followed by a more detailed discussion of control measures, including competitive experiments in fall and spring poisonings, fumigation experiments, etc.

Experimental tests were made from October 22 to December 12 of ten formulas that have been recommended for use in poisoning prairie dogs, the

destruction varying from 90 to 99 per cent. Each formula was tested twice on 100 burrows known to be occupied, the effect being determined by plugging the holes of the burrows within a few days after the distribution of the grain, as in case the prairie dogs were still alive the burrows would be opened within a week. Two formulas showed an efficiency of 99 per cent, the one most easily and quickly prepared and recommended by the author being the Colorado formula, recommended by Johnson in a circular previously noted (E. S. R., 28, p. 450). Directions given for its preparation are as follows: "Dissolve 1 oz. of powdered strychnin alkaloid (for which we substituted strychnia sulphate), one-half teacup of starch, and 1 teaspoonful of saccharin in 1 qt. of boiling water. Pour it over 12 qts. of grain (barley, wheat, or oats), which is held in a tight vessel, as a galvanized iron tub (which should subsequently be scrubbed clean). Stir the mixture very thoroughly until every grain receives a thorough coating, then spread the grain out to dry. It will keep indefinitely. Sprinkle on the mounds of the occupied burrows."

Spring tests were made between February 12 and April 15 of five of the ten formulas above mentioned, including the two which gave the best results. The formulas tested were found to rank in the same order of efficiency as in the fall, the first application giving results which varied from 53 to 77 per cent, the second application an efficiency of 0 to 28 per cent. In a demonstration of the results that could be obtained on the range from the use of the most effective formula, an extensive distribution of it resulted in the destruction of 75 to 80 per cent of the prairie dogs. The author's observations as well as those of others indicate that there are few birds killed by the exposure of the poisoned grain.

Fumigation experiments with carbon bisulphid led to the conclusion that 0.5 fluid ounce of this chemical is insufficient for the dosage of the average prairie dog burrow, since not over one-half of the animals succumb to such a treatment, but that 1 oz. is a sufficient dosage to kill from 80 to 100 per cent of the animals. An increase in dosage to 1.5, 2, or 2.5 oz. did not consistently add to the effectiveness of the fumigation. When the soil is moist from recent rains good results follow the simple careful pouring of the ounce of carbon bisulphid into the burrow, but it is thought that the most consistently satisfactory results will follow the use of the chemical on dry corn cobs. A test made of mixing carbon bisulphid with gasoline indicates that 1 oz. of pure carbon bisulphid is more effective than is 1 oz. of carbon bisulphid mixed with 1 oz. of gasoline.

A list of 23 references to the subject is appended.

The insectivorous habits of the mole in British Columbia, R. C. Treherne (*Agr. Gaz. Canada, 2 (1915), No. 3, pp. 216, 217*).—The two species here referred to which occur in the Lower Fraser Valley are *Scapanus townsendi* and *Neürotrichus gibbsi*, the latter being the more common. The author concludes that the insectivorous habits of the mole in British Columbia are important aids to the farmer in the control of soil-infecting insect pests, and that unless moles are present in exceptional numbers, their good points in all probability outnumber the bad.

The muskrat (Fiber zibethicus) and its ravages in Bohemia, O. Haempel (*Umschau, 18 (1914), No. 48, pp. 970–973, figs. 4; abs. in Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases, 6 (1915), No. 2, pp. 320, 321*).—The muskrat, four pairs of which were imported eight years ago from Canada to Dobrisch, Bohemia, and liberated, has increased to an extraordinary extent and become the source of much destruction and is also increasing in other parts of Austria and Central Europe. Its fur has gradually deteriorated since its introduction into Bohemia so that tanners now refuse the skins.

Food habits of the thrushes of the United States, F. E. L. BEAL (*U. S. Dept. Agr. Bul. 280* (*1915*), *pp. 23, figs. 2*).—Eleven species of thrushes occur within the limits of the United States, of which six are here considered, namely, Townsend's solitaire (*Myadestes townsendi*), the wood thrush (*Hylocichla mustelina*), the veery and willow thrush (*H. fuscescens* subspp.), the gray-cheeked and Bicknell's thrushes (*H. aliciæ* subspp.), the olive backed and russet-backed thrushes (*H. ustulata* subspp.), and the hermit thrushes (*H. guttata* subspp.). An account of the food habits of the five species of robins and bluebirds of the United States by the author has been previously noted (E. S. R., 32, p. 648).

The account of each species includes a classified list of the insects identified in the stomachs and the number of stomachs in which each was found. "The thrushes are largely insectivorous, and also are fond of spiders, myriapods, sowbugs, snails, and angleworms. The vegetable portion of their diet consists mostly of berries and other small fruits. . . . Thrushes of the genus Hylocichla show a very pronounced taste for ants, and the average consumption of these insects by the five species is 12.65 per cent. Few birds other than woodpeckers show so strong a liking for this highly flavored food. Hymenoptera in general, including ants, bees, and wasps, are the second largest item of insect food. Lepidoptera (caterpillars) stand next as an article of thrush diet, while Orthoptera (grasshoppers), which are a favorite food with most birds, do not seem to appeal much to the thrushes.

"The thrushes are pronounced ground feeders, and may often be seen picking small fruit that has fallen to the ground. The vegetable portion of their food (40.72 per cent) is largely composed of fruit, which constitutes over 34 per cent of the total food. Of this 30.88 per cent is made up of wild berries, which outweigh the domestic varieties with every species. In all, 94 species of wild fruits or berries were identified in the stomachs of these birds, although it is not always practicable to identify such material unless seeds or some other characteristic parts are present. . . . Domestic fruits are eaten so sparingly by the thrushes here considered as to be of no economic importance."

Report of the division of entomology for the biennial period ending December 31, 1914, E. M. EHRHORN ([*Bien.*] *Rpt. Bd. Comrs. Agr. and Forestry Hawaii, 1913–14, pp. 103–161, pls. 6*).—This, the usual biennial report (E. S. R., 29, p. 53), presents details of inspection work carried on, including the inspection of agricultural products imported into the Territory from the mainland and foreign countries, inter-island inspection, and a list of the pests intercepted. A brief account is also given of pests which during the past two years have proved quite a menace to plant life in and around Honolulu, as well as in some districts on the other islands, namely, the Japanese rose beetle (*Adoretus tenuimaculatus*), coconut palm leaf roller (*Omiodes blackburni*), alligator pear bark beetle (*Xyleborus immaturus*), tree roach (*Eleutheroda dytiscoides*), cutworms, mealy bugs, scale insects, plant lice, ants, etc.

Reports of the Work of the Insectary, by D. T. Fullaway (pp. 143–151) in introducing, breeding, and distributing parasites of the fruit fly and horn fly, and Parasitism Among the Larvæ of the Mediterranean Fruit Fly (*Ceratitis capitata*) in Hawaii during 1914, by E. A. Back and C. E. Pemberton (pp. 153–161) are appended.

Some important insect pests of the greenhouse, R. D. WHITMARSH (*Ohio Sta. Circ. 154* (*1915*), *pp. 93–104, figs. 10*).—A brief popular account is given of several of the more important insects occurring in greenhouses, including the greenhouse whitefly, greenhouse red spider (*Tetranychus telarius*), plant lice, and mealy bugs (*Pseudococcus citri* and *P. longispinus*), and means for their control.

Control of raisin insects, F. T. Bioletti (*California Sta. Circ. 134* (*1915*), *pp. 11, figs. 6*).—A more detailed account of raisin insects and their control than that previously noted (E. S. R., 32, p. 245). Descriptions and illustrations are given of an insect trap for a refuse box and of a gas-tight door for a fumigating room.

Spraying scheme for the control of insect pests on citrus trees in Florida, W. W. Yothers (*Jour. Econ. Ent.*, *8* (*1915*), *No. 2, pp. 161–164*).—It is stated that of the total damage caused by insects to citrus in Florida more than 95 per cent can be attributed to six species, which in the order of their destructiveness are as follows: Citrus white fly, purple scale, rust mite, Florida red scale, cloudy-winged white fly (*Aleyrodes nubifera*), and the red spider (*Tetranychus sexmaculatus*). The woolly white fly (*A. howardi*) and the purple mite (*T. mytilaspidis*) are said to be of secondary importance.

A spraying scheme which it is thought will largely eliminate the damage caused by these pests, having been tested quite extensively for three seasons, and generally with satisfactory results, consists in the application of paraffin oil emulsion 1:50 in May; lime-sulphur solution 1:50 to 1:75, June to July; paraffin oil emulsion 1:50, August 25 to October 31; and lime-sulphur solution 1:50 to 1:75, November or December.

Miscellaneous insecticide investigations, E. W. Scott and E. H. Siegler (*U. S. Dept. Agr. Bul. 278* (*1915*), *pp. 47*).—The authors report upon tests of new and promising arsenicals and spray combinations made at Benton Harbor, Mich., during the seasons 1912 (pp. 1–11), 1913 (pp. 11–19), and 1914 (pp. 19–27).

The conclusions drawn as a result of the three seasons' work are as follows: "Arsenate of lead proved to be the most consistent and valuable stomach poison tested, giving satisfactory results throughout the experimental work. Arsenate of lead is equally effective in either the paste or powdered form. Triplumbic arsenate of lead is less rapid as a poisoning agent than diplumbic arsenate, but is safer for use on tender foliage. Arsenate of lead may be combined with nicotin solutions and lime-sulphur solution for the control of certain apple chewing and sucking insects and fungus diseases. For the control of certain sucking and chewing insects arsenate of lead may be combined with kerosene emulsion. Arsenate of lead, kerosene emulsion, and lime-sulphur is an incompatible mixture, due to the formation of an insoluble calcium soap and the subsequent release of free kerosene. In our experience any combination containing lime-sulphur and soap should not be used, owing to the formation of an insoluble calcium soap. Arsenate of lead should not be mixed with sodium sulphid compounds, since the soluble sodium arsenate formed is destructive to leaf tissue. Arsenate of lead combined with a commercial barium tetrasulphid gave satisfactory control of the codling moth and caused no foliage injury in the experimental apple orchard.

The most promising new insecticide developed during the course of the experimental work is arsenate of calcium. This arsenical may be manufactured at less cost than arsenate of lead or may be readily prepared at home as described [in this bulletin]. During the seasons of 1912 and 1913 arsenate of calcium gave encouraging results. In 1914 a commercial arsenate of calcium paste in combination with lime-sulphur gave very satisfactory control of the codling moth. While arsenate of calcium may have certain limitations, it will doubtless prove of value for the control of chewing insects on certain host plants.

"Arsenate of iron and arsenate of zinc are not as satisfactory as arsenate of lead. Arsenite compounds are dangerous to use on tender foliage. In some instances, however, it may be possible to prevent foliage injury somewhat by combining the soluble arsenic with lime. Sodium-sulphur and potassium-sul-

phur compounds gave fairly satisfactory control of the San José scale, in some instances equaling lime-sulphur solution. They may readily be prepared at home without the use of heat."

"The following arsenical compounds were also tested at the laboratory: Arsenic sulphid, arsenic tersulphid, and arsenic trioxid. These materials are destructive to leaf tissue, and therefore undesirable insecticides. Several compounds containing no arsenic were tested, namely, barium chlorid, barium sulphate, calcium chlorid, copper oxid, lead acetate, lead carbonate, lead chromate, lead oxid, lead peroxid, mercury bichlorid, zinc chlorid, zinc oxid, and zinc sulphate. While some of these compounds gave more or less satisfactory results, they were not of sufficient promise to warrant further testing."

The insecticidal properties of various sulphids and polysulphids, P. J. PARROTT and W. J. SCHOENE (*Jour. Econ. Ent., 8 (1915), No. 2, pp. 204, 205*).—This is an abstract of a paper presented by the authors before the American Association of Economic Entomologists in December, 1914.

"The amount of sulphur in proprietary insecticides containing sulphids and polysulphids of the different bases varies greatly, ranging for the sodium preparations from 1.79 to 58.92 per cent; potassium, 2.39 to 38.72 per cent; calcium, 3.97 to 26.4 per cent; and barium, 16.54 to 44 per cent. . . . The work in general so far points to the conclusion that the strength of a preparation with regard to its sulphur content is a more important consideration than the nature of the base of the sulphids and polysulphids."

A new contact insecticide, W. M. SCOTT (*Jour. Econ. Ent., 8 (1915), No. 2, pp. 206–211*).—This article relates to barium sulphur, accounts of which by the author have been previously noted (E. S. R., 33, pp. 339, 340). The author has found dry barium sulphur to be as effective as lime-sulphur solution in the control of San José and oyster-shell scales.

The nicotin sulphate-Bordeaux combination, V. I. SAFRO (*Jour. Econ. Ent., 8 (1915), No. 2, pp. 199–203*).—The author's results and the work recorded by others indicate that nicotin sulphate may be safely added to and applied with Bordeaux in all cases where Bordeaux alone may be safely used.

Further data on poisoned bran mash flavored with fruit juice as a means of controlling some insects, G. A. DEAN (*Jour. Econ. Ent., 8 (1915), No. 2, pp. 219–227*).—This is a report of work with the Kansas bait, carried on in continuation of that previously noted (E. S. R., 31, p. 249).

Grasshopper control in New York State, E. P. FELT (*Jour. Econ. Ent., 8 (1915), No. 2, pp. 227–230*).—The author reports that the use of the Kansas bait in a grasshopper outbreak in areas bordering the Adirondacks and extending from Poland, Herkimer County, through Fulton and Saratoga counties north to Warren and Clinton counties, gave excellent results.

The mole cricket (Gryllotalpa vulgaris) damaging rice fields in Italy, N. NOVELLI (*Gior. Risicolt., 4 (1914), No. 13, pp. 189–193; abs. in Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases, 5 (1914), No. 10, pp. 1381, 1382*).—The author reports that the mole cricket is increasing in certain irrigated rice-growing districts in Italy, where it is the source of considerable damage. Wheat, oats, and barley have been badly thinned and corn so reduced as to require reseeding.

Podisma frigida in Alaska, A. N. CAUDELL (*Canad. Ent., 47 (1915), No. 5, p. 160*).

Descriptions of new American Thysanoptera, J. D. HOOD (*Insecutor Inscitiæ Menstruus, 3 (1915), No. 1–4, pp. 1–40, pls. 2*).—A new genus (Ommatothrips) and 20 species of thrips are here described as new, 12 being from the United States, 3 from Panama, 4 from Peru, and 1 from Porto Rico.

On some American Æolothripidæ, J. D. Hood (*Ent. News, 26 (1915), No. 4, pp. 162–166, fig. 1*).—*Franklinothrips tenuicornis* from Moro Island, Panama, is here described as new.

New Thysanoptera from Florida and Louisiana, J. D. Hood and C. B. Williams (*Jour. N. Y. Ent. Soc., 23 (1915), No. 2, pp. 121–138, pls. 4*).—Eleven species and 3 genera are described as new.

The Ontario mealy bug (Pseudococcus sp.), E. O. Essig (*Mo. Bul. Com. Hort. Cal., 4 (1915), No. 7, pp. 343, 344, fig. 1*).—This mealy bug, which infests citrus orchards at Upland, Cal., and was first thought to be *Pseudococcus bakeri*, is apparently a new species or one imported from some other country. The recent finding of an infestation of this species at Oakland, Cal., on a shipment of bay trees from Holland indicates that it was introduced from that country.

Preliminary report on the woolly aphis, E. N. Cory (*Jour. Econ. Ent., 8 (1915), No. 2, pp. 186–190*).—Investigations in Maryland, here reported, have led to the following conclusions:

"Of all the insecticides used Electro Pine Tar Creosote holds the greatest promise due to, first, its power to kill the aphidids; second, its strong repellent action and its retention of the penetrating odor after at least 21 months in the soil; third, its stimulative effect on diseased tissues; and fourth, the possibility of emulsifying it readily. There is a symbiotic relationship between the aphidids and *Lasius* (*Acanthomyops*) *interjectus*. There appears to be a congregating habit in *L. interjectus* of which it may be possible to take advantage in controlling the ant. Creosote is an effective repellent for this ant. Paradise stocks show some degree of immunity to attack by the root forms of the woolly aphis."

The pea aphis with relation to forage crops, J. J. Davis (*U. S. Dept. Agr. Bul. 276 (1915), pp. 67, figs. 17*).—A monograph of *Macrosiphum pisi* in which the subject is dealt with under the heading of synonymy, identity of species occurring in America, past history of the pest and its injuries, character of attack, effects on cattle of feeding them infested clover, distribution and origin, food plants, description, life history, field observations, generation experiments, hatching of the egg, molting, age at which females begin reproducing, reproductive period, longevity, fecundity of viviparous females, sexual forms, fecundity of oviparous females, natural control, and methods of artificial control.

Bibliographies of the European literature and of the American literature, consisting of thirteen pages, are appended.

A brief general account of the pea aphis by Chittenden has been previously noted (E. S. R., 13, p. 265), a second edition of which was issued in 1909.

The cabbage aphis, P. J. Parrott and B. B. Fulton (*New York State Sta. Circ. 30 (1914), pls. 2, fig. 1*).—A popular account of this pest and means for its control.

Cotton worm, L. Haseman (*Jour. Econ. Ent., 8 (1915), No. 2, pp. 192, 193*).—The author reports that during the past three years the moth of the cotton worm has migrated northward across Missouri, its damage to fruits having been considerable each year. Late peaches are said to be the moth's favorite food, though it may also attack apples, grapes, pears, tomatoes, and other fruits on the market.

The corn ear worm, L. Haseman (*Jour. Econ. Ent., 8 (1915), No. 2, pp. 214–218, pls. 2*).—A report of observations in Missouri, where the pest has been unusually abundant and the source of enormous damage to corn and other crops during the past few years.

Recent results in the use of dust sprays for controlling the corn ear worm, J. W. McColloch (*Jour. Econ. Ent., 8 (1915), No. 2, pp. 211–214*).—The author finds that the amount of corn ear worm injury can be greatly reduced by thoroughly dusting the silks with arsenate of lead, 63 per cent arsenate of lead being as effective as pure arsenate of lead. While the cost of this treatment is prohibitive where corn is raised for corn and forage purposes, this treatment is profitable where corn is grown for roasting ears, show purposes, or for seed.

Observations and researches on the vine moths, M. Topi (*Atti R. Accad. Lincei, Rend. Cl. Sci. Fis., Mat. e Nat., 5. ser., 23 (1914), I, No. 12, pp. 981–984; abs. in Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases, 5 (1914), No. 10, p. 1379*).—The author reports upon work in the control of the hibernating pupæ of *Cochylis ambiguella* and *Polychrosis botrana* carried on in Piedmont, partly in collaboration with F. Monticelli.

In investigations of the extent to which the larvæ use the tips of the supporting canes for pupation, made in order to determine the value of tipping, 25 vines stripped during the winter resulted in the discovery of 19 pupæ in the canes and 18 under the bark. If this is a general proportion the practice would prevent the emergence of but half the moths, which is not a sufficiently large proportion for a good control.

An enemy of the strawberry near Beverwijk, T. A. C. Schoevers (*Tijdschr. Plantenziekten, 20 (1914), No. 4, pp. 97–106; abs. in Rev. Appl. Ent., 3 (1915), Ser. A, No. 4, pp. 194, 195*).—Caterpillars of *Sparganothis* (*Œnophthira*) *pilleriana* are reported to have seriously damaged strawberries in the district north of Haarlem.

Defoliation by the beech bark caterpillar or red tail (Dasychira pudibunda) in the wood at Elspeet, J. Ritzema Bos (*Tijdschr. Plantenziekten, 20 (1914), No. 4, pp. 115–140; abs. in Rev. Appl. Ent., 3 (1915), Ser. A, No. 4, pp. 195–198*).—Some 125 acres of beech wood at Elspeet are said to have been completely defoliated by this caterpiller in October, 1914.

Biston hirtarius and methods of combating it, N. Sacharov (*Abs. in Rev. Appl. Ent., 3 (1915), Ser. A, No. 1, pp. 49, 50*).—Caterpillars of *B. hirtarius* were the source of considerable injury to quince trees in orchards in Astrakhan during 1913, in many cases entirely defoliating them. The species is widely distributed in Russia, and in Saratov and Astrakhan the caterpillars were also found on oak, apple, and pear trees. A chalcidid parasite is said to have destroyed from 18 to 22 per cent of them during 1913. The caterpillars and pupæ were also destroyed by *Botrytis bassiana*, some 16 per cent of the former and 18 per cent of the latter perishing from this fungus.

Stenoptycha pinicolana on larches in the valley of Aosta, M. Savelli (*Abs. in Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases, 6 (1915), No. 2, p. 319*).—This tortricid, first recorded as causing serious damage to larch wood at Argentera and Bersezio in the Province of Cuneo, Piedmont, in 1901, occurred in large numbers on larches in the valley of the Aosta during the summer of 1914. A description is given of its life stages.

Pyralidæ of Bermuda, H. G. Dyar (*Insecutor Inscitiæ Menstruus, 3 (1915), No. 5–7, pp. 86–89*).

Additional data concerning the control of the fruit-tree leaf-roller in New York, G. W. Herrick (*Jour. Econ. Ent., 8 (1915), No. 2, pp. 180–186*).—This is a report of observations conducted in continuation of work previously noted (E. S. R., 27, p. 160).

In cage experiments carried on indoors Target brand killed 94.7 per cent of the eggs and Scalecide 96.2 per cent, whereas in the check 95.75 per cent of the eggs hatched. In outdoor experiments on plum trees Target brand at 1:20

killed 92.6 per cent of the eggs, Scalecide 1:15, 91.2 per cent, and Orchard brand 87.4 per cent. In the treatment of hundreds of apple, pear, plum, and cherry trees in the spring near or after the trees had become active not a single case of injury from the oils could be found.

Life history of Menesta albaciliella, ANNETTE F. BRAUN (*Ent. News, 26 (1915), No. 4, pp. 160, 161, fig. 1*).—This paper relates to a lepidopteran which feeds beneath a web of silk on the undersurface of the leaves of the common blackberry.

An analysis of spraying methods against the codling moth, P. J. PARROTT (*Jour. Econ. Ent., 8 (1915), No. 2, pp. 164–170*).—The author reports upon an experimental application at the New York State Station of arsenate of lead and lime-sulphur with a spraying machine capable of maintaining a pressure of 300 lbs. Both Vermorel and Bordeaux nozzles were employed, but rarely did the spray reach the lower calyx cavity. A table showing the results from high and low pressure spraying indicates but a comparatively slight difference.

In a discussion which follows A. L. Quaintance states that a comparative study of the calyx cup in eastern and western apples by the Bureau of Entomology of the U. S. Department of Agriculture has shown that the western apple has a much more open arrangement of the stamen bars than the eastern apples.

The occurrence of the European boxwood leaf miner in California, H. S. SMITH (*Mo. Bul. Com. Hort. Cal., 4 (1915), No. 7, pp. 340–343, fig. 1*).—The author records the occurrence of the itonidid *Monarthropalpus buxi*[a] in a nursery in San Joaquin Valley. This dipteran, which is a native of Europe, has already become well established on Long Island (E. S. R., 33, p. 859), where it is seriously damaging boxwood hedges. It is pointed out that studies by Chaine, of Bordeaux, France (E. S. R., 30, p. 253), have shown it to attack several species of the boxwood in France, particularly *Buxus sempervirens*, *B. balearica*, and *B. variegata*, while the varieties *B. argentea* and *B. aurea* are very lightly attacked and *B. latifolia* appears to be immune. The author presents brief descriptions of the larva, pupa, and adult.

Two new Lepidoptera from the Antilles, H. G. DYAR (*Insecutor Inscitiæ Menstruus, 3 (1915), No. 5–7, p. 62*).

New American Lepidoptera chiefly from Mexico, H. G. DYAR (*Insecutor Inscitiæ Menstruus, 3 (1915), No. 5–7, pp. 79–89*).

The mosquitoes of New Jersey and their control, T. J. HEADLEE (*New Jersey Stas. Bul. 276 (1915), pp. 3–135, figs. 94*).—It is stated that the need for a popular, accurate, and easily available manual of the important mosquitoes of New Jersey has led to the preparation of this bulletin, which also includes a brief statement of the important points involved in their control. See also a previous note (E. S. R., 17, p. 56).

A new Simulium from Texas, F. KNAB (*Insecutor Inscitiæ Menstruus, 3 (1915), No. 5–7, pp. 77, 78*).

The deer botflies (genus Cephenomyia), J. M. ALDRICH (*Jour. N. Y. Ent. Soc., 23 (1915), No. 2, pp. 145–150, pl. 1*).—*Cephenomyia abdominalis* from the Adirondacks, New York, is described as new.

A new genus of Tachinidæ from the Canadian Northwest, H. E. SMITH (*Canad. Ent., 47 (1915), No. 5, pp. 153–155*).—The genus Saskatchewania is erected with *S. canadensis* n. sp. as the genotype.

Sheep maggot flies, W. W. FROGGATT (*Dept. Agr. N. S. Wales, Farmers' Bul. 95 (1915), pp. 52, pls. 3, figs. 6*).—Substantially noted from other sources (E. S. R., 24, p. 757; 29, p. 656; 32, p. 757).

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[a] Mo. Bul. Com. Hort. Cal., 4 (1915), No. 4, p. 220.

A polistiform genus of muscoid flies, C. H. T. Townsend (*Insecutor Inscitiæ Menstruus, 3 (1915), No. 1–4, pp. 43, 44*).

An acalyptrate genus of Muscoidea, C. H. T. Townsend (*Insecutor Inscitiæ Menstruus, 3 (1915), No. 1–4, p. 41*).

New Masiceratidæ and Dexiidæ from South America, C. H. T. Townsend (*Jour. N. Y. Ent. Soc., 23 (1915), No. 1, pp. 61–68*).

A genus of hystriciine flies with white maggots, C. H. T. Townsend (*Insecutor Inscitiæ Menstruus, 3 (1915), No. 1–4, pp. 45, 46*).

Some West Indian Diptera, F. Knab (*Insecutor Inscitiæ Menstruus, 3 (1915), No. 1–4, pp. 46–50*).

New Canadian and Alaskan Muscoidea, C. H. T. Townsend (*Canad. Ent., 47 (1915), No. 9, pp. 285–292*).

New Andean spallanzaniine flies, C. H. T. Townsend (*Insecutor Inscitiæ Menstruus, 3 (1915), No. 5–7, pp. 63–69*).

New Peruvian hystriciine flies, C. H. T. Townsend (*Insecutor Inscitiæ Menstruus, 3 (1915), No. 5–7, pp. 69–76*).

Duration of pupal and adult stages of the meal worm, Tenebrio obscurus, P. Rau (*Ent. News, 26 (1915), No. 4, pp. 154–157*).—A contribution to the life history of this pest.

Flea-beetles (Phyllotreta) injurious to mustard crops and methods of controlling them, N. Sacharov (*Abs. in Rev. Appl. Ent., 3 (1915), Ser. A, No. 4, p. 212*).—This is a continuation of the work on pests of mustard, previously noted (E. S. R., 31, p. 849).

The grape root worm, F. Z. Hartzell (*New York State Sta. Circ. 41 (1915), pp. 6, pls. 2, figs. 4*).—A brief popular account of this pest and means for its control based upon reports previously noted (E. S. R., 24, p. 751; 26, p. 864; etc.).

Cassava stem borer, H. A. Ballou (*Agr. News [Barbados], 14 (1915), No. 340, p. 155, figs. 2*).—Cassavas growing at the experiment station at St. Vincent are said to have been rather seriously injured by a species of Cryptorhynchus which attacks the stems.

Otiorhynchus sulcatus as an enemy of the vine in the Île d'Oléron, M. Rigotard (*Jour. Agr. Prat., n. ser., 28 (1914), No. 29, p. 94; abs. in Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases, 5 (1914), No. 11, pp. 1533, 1534*).—This weevil appeared for the first time in 1913 as an enemy of the vine in the Île d'Oléron, France.

The adult weevil devours the buds and shoots of the vines, and the larva feeds on the roots of this and other plants, including the strawberry, raspberry, peach, etc. "Of the various methods of control, the simplest and most efficacious consists in collecting the adults in traps consisting of tufts of grass, moss, or dried leaves, exposed at the base of the vines and inspected daily. A local syndicate collected as many as 90 lbs. of insects in two weeks by this method, and it requires about 7,000 insects to weigh 1 lb."

The sweet potato weevil (Cylas formicarius), H. A. Ballou (*Agr. News [Barbados], 14 (1915), No. 339, p. 138, fig. 1*).—A brief account of this insect, which, though recorded from Barbados, does not appear to be known in that island at the present time nor for many years past.

Contribution to the knowledge of the biology of Sitona lineata, E. Molz and D. Schröder (*Ztschr. Wiss. Insektenbiol., 10 (1914), No. 8–9, pp. 273–275; abs. in Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases, 5 (1914), No. 11, pp. 1526, 1527*).—This paper relates to the leaf eating pea weevil, which was an important pest in Germany in 1913.

Chain drag for boll weevil control, W. E. Hinds (*Alabama Col. Sta. Press Bul. 78 (1915), pp. 2, fig. 1*).—A brief account is given, together with an illus-

tration, of a mechanical device constructed by the author the use of which combines in one process cultivation of the crop and the drawing of fallen infested squares to the middles of the rows, where they are exposed to the heat of the sun, resulting in the killing of the weevil stages. The device is of special value during periods of hot, dry weather on soils that are not baked. A full description of this drag is given in Farmers' Bulletin 344, of this Department, previously noted (E. S. R., 20, p. 853).

A new parasite of the chinch bug egg, J. W. McColloch and H. Yuasa (*Ent. News, 26 (1915), No. 4, pp. 147–149, figs. 3*).—During the course of investigations of the life history of the chinch bug egg parasite at the Kansas State Agricultural College, an account of which parasite has been previously noted by Gahan (E. S. R., 31, p. 355), the authors have reared a second parasite that has been determined as *Abella subflava.*

A parasite of the cottonwood borer beetle, H. B. Hungerford (*Ent. News, 26 (1915), No. 3, p. 135*).—Over 90 per cent of the cottonwood borer beetles (*Plectodera scalator*) collected in western Kansas in 1913 are said to have been parasitized by *Sarcophaga vericauda,* a species hitherto reared only from grasshoppers.

Some new Chalcidoidea, J. C. Crawford (*Insecutor Inscitiæ Menstruus, 2 (1914), No. 12, pp. 180–182*).—*Tetrastichus compsivorus* reared from eggs of *Compsus auricephalus* at Chickasha, Okla., *T. agrili* reared from *Agrilus sinuatus* at Geneva, N. Y., and *Eupelminus swezeyi* thought to be parasitic on Isosoma in Johnson grass in Kaimuki, Oahu, Hawaiian Islands, are described as new.

A new species of the genus Chalcis, J. C. Crawford (*Insecutor Inscitiæ Menstruus, 3 (1915), No. 5–7, pp. 89, 90*).—*Chalcis hammari* from *Archips argyrospila* and the grape-leaf roller at Roswell, N. Mex., is described as new.

A new species of Pseudomphale from Chile, A. A. Girault (*Canad. Ent., 47 (1915), No. 7, pp. 234, 235*).

New parasitic mites (Acarina), H. E. Ewing and A. J. Stover (*Ent. News, 26 (1915), No. 3, pp. 109–114, pl. 1, fig. 1*).—*Hæmogamasus sanguineus* taken from *Mus rattus* at Ames, Iowa; *Liponyssus spiniger* from muskrat at Ithaca, N. Y.; *L. crosbyi* from bat (*Vesper subulatus*) at Rockport, Mo.; and *Proctophyllodes trisetosus* from meadow lark (*Sturnella magna*) at Ithaca, N. Y., are described as new to science.

A mite parasitic on a muskrat, T. D. A. Cockerell (*Ent. News, 26 (1915), No. 4, p. 185*).—*Lælaps multispinosus,* described from Canada but not hitherto recorded from the United States, has been found on a muskrat (*Fiber zibethicus cinnamomeus*) in Adams County, Colo.

A new genus of Canestriniidæ, N. Banks (*Ent. News, 26 (1915), No. 4, pp. 152, 153, fig. 1*).

FOODS—HUMAN NUTRITION.

The lye hulling of corn for hominy, J. W. Marden and J. A. Montgomery (*Jour. Indus. and Engin. Chem., 7 (1915), No. 10, pp. 850–853*).—Experimental data are reported of work undertaken to study the effect of different substances on the hulling of corn and the details necessary to secure the best product.

Solutions of salt, acetic acid, hydrochloric acid, and calcium chlorid, used as a substitute for lye, were entirely ineffective; sodium bicarbonate partially hulled the corn after several hours' heating, and both soda lime and lime worked fairly well. Lye proved to be the only substance which gave satisfactory results.

Not more than 2 lbs. of lye to 12 gal. of water was necessary for good hulling, while one-half of this concentration was nearly as efficient. The authors con-

clude that there should not be more than 1 bu. of corn to 20 gal. nor less than 1 bu. to 40 gal. of the lye liquid. At this concentration, a temperature of 70° C. for about 1½ hours is recommended, or a temperature of 90° for a shorter time. Efficient stirring is required. The product must finally be thoroughly washed to remove all the lye from the corn.

Kafir, feterita, milo, F. W. DAVIS (*Texas Dept. Agr. Bul. 42 (1915), pp. 18*).—Information is given regarding the use of Kafir corn, feterita, and milo maize in bread making. Recipes are included.

Vinegar (*Maine Sta. Off. Insp. 70 (1915), pp. 69–80*).—General data regarding the making of vinegar and specific directions for its home manufacture are given, based on Bulletin 258 of the New York State Station (E. S. R., 16, p. 899). A definition of vinegar is given, together with the results of the inspection of a number of samples purchased as cider vinegar.

The effect of the mineral content of water on canned foods, H. L. HUENINK and E. BARTOW (*Jour. Indus. and Engin. Chem., 7 (1915), No. 6, pp. 495, 496*).—A number of factors which influence the quality of canned goods are considered, and laboratory experiments are reported on the canning of beans in which distilled water and water containing varying amounts of calcium, magnesium, and sodium salts were used.

The results of these experiments indicate that magnesium and calcium salts, present in any of the forms studied, have a hardening effect on the canned beans. "With bicarbonates of calcium or magnesium the gradation in hardness was not so marked and consistent as with the chlorids or sulphates. This may be due to the fact that calcium bicarbonate and magnesium bicarbonate solutions are unstable, causing the concentration to change during the soaking and heating. No difference could be detected between the beans canned with water containing magnesium salts and those canned with water containing calcium salts, when the quantities of the salts in solution were equivalent. It would seem, therefore, that the effects of the magnesium ion and of the calcium ion are identical.

"The beans canned with the water containing Na_2CO_3 and those canned in water containing $NaHCO_3$ were compared and practically no difference could be detected. The same softening effect was observed in the cases when water containing $NaHCO_3$ was used as when Na_2CO_3 was used."

Experiments with other soaked vegetables and with fresh vegetables, fruits, and berries are to be undertaken.

[Food inspection and analyses], E. F. LADD and ALMA K. JOHNSON (*North Dakota Sta. Spec. Bul., 3 (1915), No. 20, pp. 337–352*).—This contains the results of the inspection of stores and other places where foods are prepared, manufactured, and sold; of analyses of several samples of rye flour; and of milling and baking tests with samples of red durum wheat. A list of foods and beverages analyzed is also given.

Clinical calorimetry.—I, A respiration calorimeter for the study of disease, G. LUSK (*Arch. Int. Med., 15 (1915), No. 5, pp. 793–804, figs. 2*).—The calorimeter established in Bellevue Hospital, New York City, is essentially a modification of the Atwater-Rosa type, the history and principles of which are briefly described in this article.

Clinical calorimetry.—II, The respiration calorimeter of the Russell Sage Institute of Pathology in Bellevue Hospital, J. A. RICHE and G. F. SODERSTROM (*Arch. Int. Med., 15 (1915), No. 5, pp. 805–828, figs. 13*).—The apparatus is described in detail, and results reported of alcohol and electric checks.

"The accuracy is such that in observations lasting 3 or 4 hours the heat production, carbon dioxid elimination, and oxygen consumption, as determined

by alcohol and electric tests, can be measured with an average error of 0.9 per cent, 0.6 per cent, and 1.6 per cent, respectively. In periods 1 hour long the average error for heat measurement was 1.2 per cent, for carbon dioxid 1.6 per cent, and for oxygen 3.2 per cent."

Clinical calorimetry.—IV, The determination of the basal metabolism of normal men and the effect of food, F. C. GEPHART and E. F. DuBOIS (*Arch. Int. Med., 15 (1915), No. 5, pp. 835–867*).—Employing the apparatus described in the previous article, measurements of the basal metabolism of 7 normal men were made to supply control data for use in the intended study of metabolism under pathological conditions.

The average basal metabolism (at perfect rest, 14 to 18 hours after eating) was 34.8 calories per hour per square meter of body surface; 34.7 calories has been adopted as the average for normal men between the ages of 20 and 50 years.

"All of the subjects studied in the bed calorimeter were within 11 per cent of this average. . . .

"The conclusion is drawn that among groups of men of varying weights metabolism is proportional to surface area according to Rubner's law and is not proportional to body weight. By using the surface area as a basis one can refer all individuals to a single average normal figure, 34.7. If one uses the body weight as a basis a different normal figure is required for each weight.

"The methods of direct and indirect calorimetry in disease agree in 2 and 3 hour periods, and in health may be found to agree in hourly periods. In the total measurement of 4,577 calories in the experiments reported in this paper the two methods have agreed within 0.17 per cent. In a total of 30 one-hour periods on one normal subject the two methods have agreed within 5 per cent in 21 individual hours and within 10 per cent in 27 of the periods.

"The method of indirect calorimetry, using the oxygen consumption as a basis, gives the best results in hourly periods. The method of direct calorimetry in short periods is made difficult by uncertainty as to the correct specific heat of the body and also by the fact that the different parts of the body do not always change their temperatures at the same rate. . . .

"The most satisfactory method of determining the effect of food in increasing heat production in normal subjects and patients is to determine the basal metabolism at frequent intervals, and on days shortly after a basal determination administer the food before the subject is sealed in the calorimeter. It has been found that 200 gm. of dextrose or its equivalent in commercial glucose, or a casein meal with 10.5 gm. of nitrogen, increase the heat production by about 12 per cent over a period of 3 to 6 hours."

Clinical calorimetry.—V, The measurement of the surface area of man, D. and E. F. DuBOIS (*Arch. Int. Med., 15 (1915), No. 5, pp. 868–881, figs. 2*).—A method for measuring the area of the body surface is described in detail, and the data of five different measurements reported. The total surface area as determined by this method has been found to vary with that calculated from a new formula by an average error of 1.7 per cent. The new formula is based on the factors of length and average breadth, rather than on weight.

The protein need of infants.—Being metabolism studies of a two months' old infant fed with varying proportions of cow's milk protein, B. R. HOOBLER (*Amer. Jour. Diseases Children, 10 (1915), No. 3, pp. 153–171*).—The subject of these experiments, a robust, healthy boy, was under observation for 16 days. The metabolism was determined for 37 periods of 1 hour each. A special respiration chamber, previously described by Murlin (E. S. R., 32, p. 860), was used during some of the periods, and during the remainder a small calorimeter

of the Atwater-Rosa type. During the first four days of the experiments one-third whole milk with 5 per cent dextrimaltose was the low-protein ration fed. The amount of protein was gradually increased until the end of the experiments. Full data are given regarding the protein balance and the energy metabolism during the periods of low- and high-protein diet. From the experiments the following conclusions are drawn:

"Protein when fed in excess of need causes an increase in the energy metabolism. The increase is in proportion to the amount of protein oxidized, and not to the amount of protein added to the body. Protein when fed in excess does not reduce the amount of fat and carbohydrate metabolized, but the fat and carbohydrate need remains fairly constant, and unless the minimal need of fat and carbohydrate is supplied in the food the organism will draw on its stored-up fat and glycogen to supply the difference between the amount fed and that which is metabolized.

"When protein is fed greatly above its need it tends to produce a condition of stupor which assumes serious proportions if such feeding is continued. This stupor gradually disappears as protein is reduced in the diet. This condition is best considered as a protein-food injury and constitutes a clinical entity as definite in its symptomatology as that which arises from too prolonged use of a rich carbohydrate diet.

"The protein need of the growing infant is supplied when 7 per cent of its caloric need is furnished in protein calories. A general rule which will approximate the protein need is to furnish $\frac{3}{4}$ oz. of whole, skimmed, or top milk per pound weight of child, or if the metric system is applied, $\frac{1}{20}$ of the body weight in skimmed, whole, or top milk. To keep the protein calories in any formula approximately 7 per cent of the total, the following rule regarding the addition of sugar or cereal gruels, or both, may be followed: For each ounce of whole milk add $\frac{1}{3}$ oz. of sugar or cereal. For each ounce of top 16 oz. (7 per cent) milk add $\frac{1}{4}$ oz. of sugar or cereal. For each ounce of top 10 oz. (10 per cent) milk add $\frac{1}{6}$ oz. of sugar or cereal.

"It is clearly recognized that rules outlined for feeding for nutritional purposes only can not be followed when one feeds a food for therapeutic as well as nutritional purposes, hence the feeding of albumin or skimmed milk, i. e., a high protein food, is justified on the ground of its being a therapeutic measure and should be discontinued when the therapeutic indication no longer exists."

Ninety-three persons infected by a typhoid carrier at a public dinner, W. A. Sawyer (*Jour. Amer. Med. Assoc., 63 (1914), No. 18, pp. 1537–1542, fig. 1*).—This article reports the investigation of an epidemic of typhoid fever caused by eating food at a public dinner.

The food was found to have been infected by a typhoid carrier who had no knowledge of ever having had the disease. A study of the manner in which the infection reached the food fastened suspicion on a dish of Spanish spaghetti. This dish, which contained a thickening sauce composed chiefly of milk, was prepared by the carrier in her home on the day before the dinner. The baking of the dish was done at the dining hall during the morning before the meal. As there was ample time for the dish to become infected with the typhoid organisms during its preparation, it was only necessary to prove that the dish was a favorable medium for the growth of the typhoid bacillus and that the final baking of the dish had been insufficient to sterilize it, in order to prove definitely that the spaghetti had been the source of infection. To determine these two points laboratory experiments were conducted which produced valuable data regarding the temperatures reached in baking as carried out by the ordinary household methods.

A dish of spaghetti was prepared in the laboratory under conditions simulating as nearly as possible those under which the original dish had been prepared, and inoculated with a broth culture of the typhoid bacillus of the strain obtained from the carrier. This material, which was 5 in. deep and from 9 to 13 in. in diameter, was baked in the hot oven of an ordinary gas range for 15 minutes. At the end of this time the temperature in the middle of the spaghetti had risen from 16 to 17° C. and after standing in the room for one-half hour rose to 21° as the heat penetrated to the inner portion. Cultures made from the contents of the dish at various depths, after this baking, all developed colonies of the typhoid bacillus.

The spaghetti was next introduced into a hot air sterilizer, which had been heated to between 160 and 170°, and was subjected to this temperature for 30 minutes. At the end of that time the appearance of the dish suggested thorough cooking but the temperature at the top was found to be 54° and at the middle only 23°. Cultures made from the contents of the dish, at various depths, after this baking showed the presence of typhoid bacilli.

The dish of spaghetti was finally introduced into an oven maintained at 207 to 214° and subjected to this temperature for one-half hour. Examination of the dish at the end of this period showed the temperature just beneath the surface of the spaghetti to be 83°, at the middle 28°, and at the bottom 48°. After standing in the room for one hour the temperatures were 46° near the top, 42.5° at the middle, and 43° near the bottom. Cultures taken from the middle of the dish showed an abundance of typhoid bacilli. These results showed conclusively that the baking, which the dish had received after being infected, was not sufficient to produce sterilization.

Portions of the sauce were sterilized, inoculated with the same strain of the typhoid bacillus, and allowed to incubate. A study of the rate of development of the bacteria showed the sauce to be a good culture medium for the typhoid bacillus, although somewhat inferior to sterilized skim milk. In the opinion of the author the results of this investigation demonstrate that "cooked dishes must be considered as possible conveyers of infection unless it can be shown that the method of cooking would produce complete sterilization. The slowness with which heat penetrates dishes like the Spanish spaghetti shows that very prolonged heating would be necessary for sterilization of large dishes of such food. Ordinary baking merely incubates the interior of these masses of food."

Some results of the first year's work of the New York State Commission on Ventilation, C. E. A. WINSLOW, D. D. KIMBALL, F. S. LEE, J. A. MILLER, E. B. PHELPS, E. L. THORNDIKE, and G. T. PALMER (*Amer. Jour. Pub. Health, 5 (1915), No. 2, pp. 85–118, figs. 11*).—The problems studied by the commission during the first year involved chiefly the determination of biological standards for good ventilation, and dealt mainly with the investigations of the physiological effects of high heat, alone or combined with high humidity, chemical effluvia of various sorts resulting from human occupancy, drafts or exposure to cold air, and air of extremely low humidity.

It was found that a very high room temperature, such as 86° F. with 80 per cent relative humidity, produced slight but distinct elevation of body temperature, an increase in declining heart rate, a very slight lowering of systolic blood pressure, and other physiological derangements. These extreme conditions of temperature and humidity, however, showed no effect upon rate of respiration, respiratory quotient, rate of heat production, rate of digestion, and carbohydrate or protein metabolism; nor was the actual power to do either mental or physical work diminished, but the inclination to do such work was diminished.

Moderately high room temperature (75°) with 50 per cent relative humidity had all the effects of the higher temperature but in less degree.

Stagnant air at the same temperature as fresh air, even when it contained 20 or more parts per 10,000 of carbon dioxid and all the organic and other substances in the breathed air of occupied rooms, did not appear to produce any physiological disorders, nor to influence the comfort of the subjects nor the power or inclination to do physical or mental work. The appetite for food, however, did seem to be slightly reduced.

ANIMAL PRODUCTION.

Studies on the physiological action of some protein derivatives, F. P. Underhill and B. M. Hendrix (*Jour. Biol. Chem., 22 (1915), No. 3, pp. 443–470*).—This article is considered under three headings, as follows:

(1) *Are Proteoses Prepared from Zein and Gliadin Physiologically Active?* Recent developments concerning the physiology of proteins have been the discovery of the phenomenon of anaphylaxis and the demonstration of the relation of the amino acid content of the different proteins to their ability to meet the nitrogen requirements of the animal body. In this connection the subject of peptone intoxication has received attention, anaphylactic shock and the physiological action of peptone being two varieties of protein intoxication.

In investigations on this subject, in which dogs were used as experimental animals, the authors found that "the intravenous injection of zeoses in relatively large doses (0.5 gm. per kilogram) causes a fall in arterial pressure and inhibits the coagulation of the blood. Smaller doses are without marked effect. Gliadoses have a very strong inhibiting action on the coagulation of the blood and a somewhat less marked effect on the arterial pressure. The statement of Knaffl-Lenz that the presence of tryptophane in proteoses is responsible for their physiological action could not be confirmed. The suggestion is made that the failure of Knaffl-Lenz to obtain characteristic effects with his preparations is probably due to the relatively small amount of proteoses contained in the digestion mixtures employed."

(2) *The Relation of Racemization to the Physiological Action of Proteins and Proteoses.*—In these studies it was found that "crude racemized proteins produce toxic symptoms when introduced into the circulation. The evidence in case of racemized zein is not decisive, inasmuch as some preparations exhibit typical effects, whereas with others no influence can be demonstrated. Purified racemized proteins show no poisonous action. The washings from crude racemized proteins contain a toxic substance. A portion of the active substance can be removed from racemized proteins by extraction with alcohol. Efforts to remove the poisonous material completely by this means were unsuccessful. Proteoses prepared by acid digestion of racemized proteins are probably as toxic as those prepared from the native proteins. Of the racemized proteoses the caseoses and albumoses are quite toxic, but the zeoses seem to be inert."

(3) *The Physiological Action of Vaughan's "Crude Soluble Poison."*—It is stated that V. C. Vaughan has shown that a very toxic body can be prepared by digesting any true protein with an alcoholic solution of sodium hydroxid. Evidences of toxicity of this substance were yielded by subcutaneous injections into guinea pigs. Injections of this substance into the blood of dogs and rabbits were also made.

It was found that "Vaughan's preparation is much more toxic than Witte's 'peptone.' The statement of Edmunds [E. S. R., 30, p. 180] that Vaughan's 'crude soluble poison' has no action on the coagulation of the blood is not con-

firmed. On the contrary, a very marked effect was noted. In its action on blood pressure and on blood clotting, Vaughan's crude soluble poison strongly resembles the proteoses. Vaughan's preparation differs from the proteoses in that it produces marked symptoms or even death in the rabbit in relatively small doses. Boiling with dilute hydrochloric acid to the abiuret stage destroys the toxicity of Vaughan's product."

The character of the water-soluble nitrogen of some common feeding stuffs, E. B. Hart and W. H. Bentley (*Jour. Biol. Chem., 22 (1915), No. 3, pp. 477–483*).—In dissecting the water-soluble nitrogen of some feeding materials for the purpose of securing a clearer picture of the composition of the so-called "amid" nitrogen, the authors found that this material "is largely composed of free amino acids and peptid linkings. In most cases the nitrogen in these structures constitutes 50 to 70 per cent of the water-soluble nitrogen. The acid amid nitrogen is relatively small, seldom exceeding 20 per cent of the the water-soluble nitrogen, and more often being below 10 per cent. Corn stover is an interesting exception, showing approximately 40 per cent of the water-soluble nitrogen in acid amid form. The ammonia nitrogen rarely exceeded 5 per cent of the total water-soluble nitrogen, and in some instances was wholly absent."

Utilization of rice straw, N. Novelli (*Gior. Risicolt., 5 (1915), No. 9, pp. 147–154, fig. 1*).—The average digestible nutrients of rice straw are given as protein 1 per cent, fat 0.44 per cent, and carbohydrates 28.63 per cent. Ensiled rice straw has been found to be a desirable feed material.

Analysis of peanut oil cake, A. G. Holborow (*Rhodesia Agr. Jour., 12 (1915), No. 4, pp. 527, 528*).—The following analysis is given of peanut oil cake: Moisture, 10.38 per cent; protein, 41.18; ether extract, 10.96; nitrogen-free extract, 29.82; crude fiber, 3.68, and ash, 3.98 per cent.

Inorganic fodder (*Sci. Amer., 113 (1915), No. 1, pp. 8, 9.*)—Announcement is made of an invention at the Institute of Fermentation Industries, Berlin, which will allow a nourishing yeast containing more than 50 per cent of albumin to be prepared from sugar and ammonium sulphate. In order to supply the albumin, sugar is "fertilized" with ammonia, potash, and magnesia, in the form of their salts, after which some yeast is introduced and a strong air current applied. The yeast then absorbs the sugar and the "fertilizer," thus resulting in the formation of a highly albuminous yeast. It is claimed that the dry yeast obtained constitutes an excellent nourishing fodder for cattle and horses.

Feeding stuffs report, 1914, J. W. Kellogg (*Penn. Dept. Agr. Bul. 265 (1915) pp. 221*).—Analyses are given of cotton-seed meal, linseed meal, distillers' dried grain (from corn and rye), brewers' dried grains, malt sprouts, corn gluten feed, corn gluten meal, hominy feed, corn bran, corn feed meal, low grade flour, wheat middlings, wheat bran, rye middlings, buckwheat middlings, alfalfa meal, dried beet pulp, and various mixed and proprietary feeds.

A system of recording types of mating in experimental breeding operations, R. Pearl (*Science, n. ser., 42 (1915), No. 1081, pp. 383–386, fig. 1*).—The author describes a system of recording types of mating in experimental breeding operations which is thought to aid in expressing adequately and completely, and at the same time briefly and simply, the general nature or type of the pedigree by which particular individuals in the F_2 and F_3 generations are descended.

The amount of nutriment required by fattening cattle, F. Honcamp et al. (*Ber. Landw. Reichsamte Innern, No. 36 (1914), pp. 130*).—This is a review of experiments conducted at eight substations on the relative value of rich and poor rations for cattle feeding. A ration rich in starch value (about 13.5 kg. per 1,000 kg. live weight) produced an average daily gain per head of 1.023 kg., and a ration poor in starch value (about 11.5 kg. per 1,000 kg. live weight), 0.949 kg.

Fitting cattle for the show-ring, C. H. Makin (*Breeder's Gaz., 68 (1915), No. 13, p. 497, figs. 2*).—A general description is given of methods used by prominent breeders in fitting cattle for the show-ring.

The value of sheep on alfalfa farms in Pecos County, Texas, S. A. Minear (*Bul. Ft. Stockton, Tex., Sheep Feeding Expt.* [*1915*], *pp. 7, fig. 1*).—In this experiment 600 aged grade Rambouillet ewes bred to Rambouillet rams were used. A portion of these ewes with their lambs were divided into two lots, lot 1 being fed alfalfa hay, silage, and ground milo maize, and lot 2 alfalfa hay and ground milo maize, both lots being pastured on alfalfa. During the 57 days' feeding period the average gains per head were for lot 1, ewes 6.5 lbs., lambs 20.5 lbs.; lot 2, ewes 6.1 lbs. and lambs 16.1 lbs., it costing 2.6 cts. to produce a pound of gain in lot 1 and 3.6 cts. in lot 2. These results indicate that when alfalfa range is short during winter months it may be supplemented tc advantage with silage.

The lots were then consolidated and fed for about two months, the lambs being marketed in May and June. During 25 days, following consolidation, the sheep were fed ground milo maize, silage, and alfalfa hay, the lambs eating grain separate from the ewes. Silage and hay were then discontinued. During the following 28 days the ewes were fed no grain but the lambs received ground milo maize. During the entire 89 days the lambs made average gains per head of 36.8 lbs. The 125-day-old lambs were put on the market weighing 63.3 lbs.

Considering the entire herd of ewes and lambs, the approximate cost of producing one pound of gain of live weight was 4.4 cts. The cost of producing the lambs by way of feed they actually ate and the labor devoted to them was estimated to be much less than 4.4 cts. per pound. A profit of $1,516.89 was secured from an investment of $1,950.

In connection with this experiment it was found that suckling lambs do not suffer from bloat like older sheep. Keeping the sheep on alfalfa range day and night gave a smaller death rate than allowing them to graze one-half day at a time.

Reversion in sheep, L. L. Heller (*Jour. Heredity, 6 (1915), No. 10, p. 480, fig. 1*).—The Rambouillet breed, a French improvement on the Spanish Merino, is one of the most highly improved of all sheep. Its color is pure white.

A description is given of a twin ewe Rambouillet lamb recently dropped at the Wyoming Experiment Station, showing a reversion of black on a portion of the body, the other twin being the normal white. The ventral part of the body, the legs, the lower part of the neck, the face, with the exception of a bar between the eyes, and the inside of the ears are black. It is said that the markings of the Barbados or woolless sheep are sometimes after this same pattern. It has also been noted in crosses of the Southdown and Barbados.

The question is raised as to whether our improved breeds could have come from a similar type, and whether this character has for the most part been latent during the past several centuries and cropped out only at intervals.

Degree of resemblance of parents and offspring with respect to birth as twins for registered Shropshire sheep, H. L. Rietz and E. Roberts (*U. S. Dept. Agr., Jour. Agr. Research, 4 (1915), No. 6, pp. 479–510*).—Data from the American Shropshire Sheep Record were collected and examined at the Illinois Experiment Station to determine whether and to what extent the offspring of parents born in twins and of grandparents born in twins are more likely to be twins than if these ancestors are born as singles.

It was found that in general the twin parents give a larger percentage of twins among offspring than do parents born as singles. The small positive correlation coefficient between the sum of numbers in litters in which the two parents are born and the size of litter in which the corresponding offspring

are born is significant. The value of the coefficient is in each case more than 11 times the probable error. The small positive correlation coefficients between sizes of litters in which dams are born and sizes of litters in which their offspring are born are decidedly significant when judged by probable errors. There appears to be a small but significant correlation between sizes of litters in which sires are born and sizes of litters in which their offspring are born. It seems probable that this correlation should be attributed almost entirely, if not wholly, to correlation between sires and male offspring. The correlations seem to differ with the sexes. The correlation coefficients for sires and female offspring are so small that their significance is much in doubt even with the large numbers used.

There appears to be a correlation between maternal granddams and offspring, but there is no apparent correlation for the other grandparents and offspring. It is pointed out that it would surely require immense numbers to establish the significance of such correlation, if it exists. The means of arrays show the small but general tendency of either or both twin parents and twin maternal granddams to produce a larger proportion of twins than are produced when the corresponding individuals in the ancestry are singles.

It is suggested that, as it requires large numbers to establish the significance of the differences which have been found, it should not be surprising if within a flock of no more than 100 there is in some cases even a larger percentage of twins from single parents than from twin parents.

Preliminary note on wool inheritance, P. G. BAILEY (*Abs. in Rpt. Brit. Assoc. Adv. Sci., 1914, pp. 654, 655*).—A cross was made between two Merino rams and 20 Shropshire ewes, 31 F_1 rams and 41 F_1 ewes being obtained from this cross. An F_1 ram was mated to the F_1 ewes, and from these 6 rams and 8 ewes were shorn.

The range of qualities of the wool were as follows: Merino rams 64's, Shropshire ewes 54 to 50's, F_1 rams 60 to 44's, F_1 ewes 60 to 50's, F_2 rams 60 to 54's, and F_2 ewes 60 to 54's. There is a high range of variation in the F_1 generation, but the great bulk of the F_1 sheep are of a quality intermediate between those of its Merino and Shropshire parents. No accurate investigation has been made into the amount of grease in fleeces, but it was seen that the F_1 generation was intermediate in this respect between the two parents. A microscopical investigation of the average diameter of the fibers indicates that the great bulk of the F_1 sheep are intermediate as regards this character.

It has been found that in order to obtain a probable error of less than 3 per cent of the average of any sample it is necessary to take 160 measurements of that sample. There is a large variation in the range of the weights of the F_1 fleeces. The F_1 generation is also intermediate as regards the number of waves per inch.

Feeding olive pomace to swine, C. GUGNONI (*Mod. Zooiatro, Parte Sci., 26 (1915), No. 4, pp. 154–165*).—In feeding trials with swine, in which both fresh and dried olive pomace were fed in addition to a basal ration of beans, corn, and potatoes, the olive pomace compared favorably with a corn ration. The fresh olive pomace is said to contain 89.98 per cent of dry matter, of which 5.36 per cent is digestible protein, 35.95 per cent digestible nitrogen-free extract, and 9.98 per cent digestible fat, and the dried pomace 85.71 per cent dry matter, of which 5.69 per cent is digestible protein, 35.38 per cent digestible nitrogen-free extract, and 1.7 per cent digestible fat.

Seventeen years selection of a character showing sex-linked Mendelian inheritance, R. PEARL (*Amer. Nat., 49 (1915), No. 586, pp. 595–608, fig. 1*).—A résumé to date is given of an investigation which was begun in 1898 having

for its purpose the improvement by selection of winter egg production in Barred Plymouth Rock fowls. Methods of breeding pursued (1) from 1898 to 1907, the period of mass selection (E. S. R., 18, p. 471), and (2) from 1908 to 1912, the period of progeny testing in which selection was made for low winter egg production as well as for high production (E. S. R., 21, p. 271), have already been noted. Since 1912 all selections for low and mediocre egg production have been discontinued.

Tabulated results of the 17-year selection period in which were involved 4,842 birds of which exact trap nest records were kept show that during the period of mass selection the trend of mean winter production was downward with minor fluctuations from year to year. Since 1907–08 there has been, with the exception of two years, a gradual increase of mean winter egg production. The mean winter production of all birds selected for high production from 1908 to 1915 was 51.49 eggs and from 1908 to 1912 for all birds selected for low production 20.14 eggs. The mean winter production for whole flocks over the entire period of the investigation was 35.05 eggs, which, in the opinion of the author supported by data presented, represents about the average winter production of mixed flocks of this breed of fowls.

The reason no effect was produced during the first ten years of selection and the marked effect produced during the last seven years was, in the author's opinion, because genotypically high producers were uniformly selected (in the high lines) during the latter period and were not selected during the former period. "By the introduction of the progeny test as an essential part of the selection the whole process of the creation of a highly fecund race of hens was transferred from the realm of blind chance to that of precise and definite control. . . . To be effective in changing the average productiveness of a flock of poultry selection we must pick out those birds as breeders which carry the factors for high fecundity genetically, i. e., as an integral part of their hereditary make-up, and not any other birds."

The bearing of these results upon the general problem of the effectiveness of selection in modifying germinal determiners is discussed.

The effect of pituitary substance on the egg production of the domestic fowl, L. N. Clark (*Jour. Biol. Chem., 22 (1915), No. 3, pp. 485–491*).—Pituitary substance was prepared from the brains of growing mammals and what amounted to 20 mg. of fresh pituitary substance (anterior lobe) were administered with the feed to each hen, per day, 690 hens being treated in this way.

It was demonstrated that the feeding of this pituitary gland substance increased the egg production of hens whose production curve was on the decline. The dosage was effective on the fourth day after the first dose and lasted for several days after the last dose. The hatchability of eggs from dosed parents was increased. It is thought that positive results were obtained from the use of the pituitary gland taken from growing mammals, and negative results from this substance taken from adults, which latter fact may account for the negative results of other investigators (E. S. R., 33, p. 472).

Diuresis, the pituitary factor, D. Cow (*Jour. Physiol., 49 (1915), No. 6, pp. 441–451, figs. 8*).—It was found that the increase in diuresis which follows injection of extracts of duodenal mucous membrane is independent of the salt content of such extracts, though such salt content may also produce an increased flow of urine, is indirect, and is dependent on activity of the pituitary body, which is stimulated by the injection of such extracts. The probable sequence of events concerned in the production of diuresis is ingestion of fluid by the mouth; absorption of such fluid from the gastrointestinal tract; and the absorption by such fluid of some substance contained in the gastrointestinal

mucous membrane; stimulation of the pituitary body by this substance; and increased diuresis.

DAIRY FARMING—DAIRYING.

Official tests of dairy cows, F. W. Woll and Cora J. Hill (*California Sta. Circ. 135 (1915), pp. 10, figs. 4*).—This circular gives general instructions on methods of making official dairy tests and the rules governing them.

Cream and milk (*Maine Sta. Off. Insp. 69 (1915), pp. 57–68; 71 (1915), pp. 81–100*).—The results of examinations of samples of milk and cream in Maine are given. General notes by A. M. G. Soule on conditions in the State are included (pp. 97–100).

Dairy bacteriology at the Berne Congress, 1914, C. Gorini (*Bol. Min. Agr., Indus. e Com. [Rome], Ser. B, 14 (1915), I, No. 3–4, pp. 80–84; abs. in Cream. and Milk Plant Mo., 3 (1915), No. 10, pp. 24–26*).—In a report of this congress the author states that observations made by Alice Evans, E. C. Hastings, and O. Gratz corroborate his conclusion that several groups of lactic acid bacteria are concerned in the ripening of cheese, including among others the round forms of the micrococcus type, divided into two classes, one which does and one which does not liquefy gelatin (*Micrococcus casei acido-proteolyticus* I and II). The necessity of basing the distinction of lactic acid bacteria not so much upon form as upon physico-chemical properties, and of keeping up a distinction between the acido-proteolytic organisms, so called because they are capable of attacking the casein in an acid medium, and the common lactic acid bacteria or alkalino-proteolytic organisms, so called because they can attack the casein only in alkaline or at least neutral media, was emphasized.

The classification of the lactic acid bacteria, it was maintained, should be based upon prolonged and repeated observations as to changes in the quality of the milk and conditions of life as to temperature, aerobiosis, etc. These observations were confirmed by O. Jensen. It is believed that the variability of the bacterium, other things being equal, depends upon differences in the quality of the milk. The milk quality is subject to substantial fluctuations according to types, physiological condition, and feed of cows, etc., modifications of the milk before it reaches the laboratory, sterilization or preservation before inoculation, etc. S. Paraschtschuck called attention to the great difference in resistance, aroma, and fermenting power of different types of lactic acid bacteria according to the varying properties of the milk. In a good, freshly taken milk the lactic bacteria are strong and, as it were, rejuvenated; in a poor, badly kept milk, though sterilized, they become weak because sterilization fails to destroy the toxic products present in the milk. This confirms the theory that in order to improve cheese manufacture and profitably use pure cultures it is necessary to start with a hygienic milk.

The development of peptonizing germs in the culture milk before sterilization may exert a marked influence upon the behavior of the lactic acid bacteria. O. Jensen confirmed this observation and suggested the addition of peptone to milk for the purpose of strengthening these bacteria. The author states that his acid-rennet-forming bacteria act in a similar way, there being a peptonizing action upon the casein and a consequent stimulation of the activity of the microbes within the cheese. Also, the acid-rennet-forming bacteria from the udder contribute to the ripening of cheese by generating peptone in the milk.

O. Jensen called attention to the capacity of young lactic acid bacteria to produce ropiness. This phenomenon has not been fully understood by investigators. Most lactic acid bacteria in the first stages of development form a

capsule which by its stickiness causes viscosity, but this condition vanishes when the milk curdles. An account of certain types of *Streptococcus lacticus*, which are able to peptonize the casein if kept at low temperatures (between 15 and 20° C.), was given by C. Bartel. These types of lactic acid bacteria are regarded as of importance in the ripening of cheese which generally proceeds at low temperatures. The author has found that temperature exerts considerable influence upon the proteolytic power of lactic acid bacteria, higher temperatures favoring the disintegration of lactose, while lower temperatures promote the degradation of the casein. It is said that the finding of these bacteria emphasizes the necessity of classifying according to physiological functions rather than morphologically in order to make proper selections of bacteria for cheese making.

The necessity of employing lactic acid bacteria in general in cheese manufacture, in order to improve the taste and appearance and prevent spoilage, was pointed out by E. Kayser, Löhnis, A. Peter, et al. Gratz, who divides these bacteria into three classes, viz, micrococcus, streptococcus, and bacillus, remarked that the type most generally used is *Streptococcus lactis*, while *Bacillus lacticus* is used less frequently, and still less the combination of the three types. Evans and Hastings observed that in order to produce a typical Cheddar cheese four morphological groups, viz, *Bacterium lactis acidi*, *B. casei*, the streptococcus, and the micrococcus are required, *B. lactis acidi* giving a sour taste, the streptococcus a delicate acidulous taste, and *B. casei* a tart taste, and that the best aroma is obtained if the pasteurized milk is inoculated with a mixture of *B. lactis acidi*, streptococcus, and micrococcus. O. Jensen credited the greatest importance to *B. casei* and von Freudenrich to the ferments of propionic acid. The author believes it is too early to give preference to one species of lactic acid bacteria over the others.

The author presented the experience of the "Pro Grana" Association on the manner of employment of the lactic acid bacteria. It is said that the employment of pure cultures should be accompanied by a hygienic standard in the production, collection, and treatment of the milk. Impure rennet that carries living ferments into the milk besides the enzyms desired should be abandoned. The rennet commonly used for Swiss cheese is of this sort, being prepared by an extraction of calves' stomachs. It often contains cultures of ferments that are detrimental to cheese production.

R. Ostertag, in discussing the sanitary control of milk, stated that in order to detect the abnormal infection of milk by acid-rennet-forming bacteria and distinguish it from that by common lactic acid bacteria the test by the lactozymoscope does excellent service, the former bacteria provoking the characteristic, rather soft curd with an abundant generation of clear whey which makes cheesy milk and is clearly distinguished from the firm, dry, porcelainlike coagulum produced by the common lactic acid bacteria. The zymoscopic method not only affords a means of judging the condition of milk with reference to cheese making and calling attention to abnormal if not pathological conditions of the udder, but, since such conditions are largely due to imperfections in milking, it may also offer the veterinarian reliable data for detecting faults and carelessness in milking which at times cause disturbances in the manufacture of cheese and decided pathological symptoms. Such control will be particularly valuable if applied to the milk from individual cows or even each separate quarter of the udder.

Bacteriological studies on two yellow milk organisms, B. W. HAMMER (*Iowa Sta. Research Bul. 20 (1915). pp. 135–149, figs. 2*).—The morphological, cultural, and biochemical characteristics of two organisms, isolated in the dairy

bacteriological laboratory and peculiar in their action on the cream layer of milk in their producing a decidedly yellow color in it without breaking down the fat, are described.

"*Bacillus synxanthus* was isolated from a sample of milk secured in one of the smaller towns of Iowa. The action of this organism on various materials has been studied and the results obtained with cream indicate that the odor and flavor produced are so objectionable that the organism can not be used for the production of color in butter.

"A micro-organism that produces a yellow color on the surface of whole milk was isolated from a sample of butter. The organism is believed to be a new species and has been described and named *B. aurantinus*. Inasmuch as it acts very slowly on milk its use for the production of color in butter is out of the question.

"The study of these two organisms indicates that eventually an organism may be found that can be used for the production of color in butter."

Bacteriological studies on the coagulation of evaporated milk, B. W. HAMMER (*Iowa Sta. Research Bul. 19* (*1915*), *pp. 119–131, figs. 3*).—The morphological, cultural, and biochemical characteristics of a heretofore undescribed organism found in samples of evaporated milk from an Iowa condensery are given. The name proposed for this organism is *Bacillus coagulans*.

While a very small percentage of the spoiled cans showed a bulging due to the formation of gas, the typical change did not involve any such condition, but was merely a coagulation. On opening such cans a small amount of expressed whey was commonly present and the coagulum was found to be very firm, although not firm enough to retain its shape when the end was cut from the can and the contents slipped out. The spoiled condensed milk had a sweetish, cheesy odor not at all disagreeable and resembling to a certain extent the odor of Swiss cheese; it was not in the least suggestive of putrefaction. The flavor of the milk was faintly sour and slightly cheesy, but not at all disagreeable.

A study of the manufacture of dairy butter, E. L. ANTHONY (*Pennsylvania Sta. Bul. 135* (*1915*), *pp. 3–30, figs. 7*).—During 1913 four educational butter-making contests were conducted among the dairy butter makers of Pennsylvania. There was found to be a great lack of uniformity in farm butter, the variation being to some extent due to the churns used, but more especially to the methods used in churning and in the handling of the cream during the ripening process. It was also found that the average percentage of moisture in farm butter is very low.

In experiments with different types of churns, the combined churn and worker and the barrel churn churned somewhat closer than the swing churn, thus leaving less butter fat in the buttermilk. This is thought to be due to the character of the agitation within the former two churns and to the fact that the temperature of the cream rose less during churning. The moisture content averaged a little higher in the butter from the combined churn. This is probably due to the fact that the butter in this type of churn is worked in the water.

In an experiment to determine what percentage of acid in the cream is best for churning under farm conditions creams of 0.2, 0.3, 0.4, 0.5, and 0.85 per cent acidity were used. The flavor of the butter increased up to about 0.4 per cent of acid, when it began to deteriorate and to take on an old and stale cream quality. It is advised that cream be not ripened to more than 0.5 per cent of acid, and as little as 0.4 per cent is sufficient under the average farm conditions. Cream held at from 70 to 75° for ten hours will develop under normal conditions about that amount of acid, and will be slightly thick and noticeably sour. It is stated that butter with lower acidity is being demanded by the market.

Tests were made of four methods of handling cream before churning, as follows: (1) Holding the cream below 45° until enough was secured for churning, adding each day's gathering and stirring, and when enough was secured raising the temperature to 75°, and ripening over night or until 0.5 per cent of acid was developed. (2) Ripening the first gathering by holding it at 75° until 0.35 per cent of acid was developed, and then cooling to cellar temperature (55°), and adding each gathering after cooling directly to the first; and so on until enough had been secured for a churning; then churning the whole without further ripening. (3) Adding a quart of good buttermilk to the first gathering, adding each subsequent day's gathering to that, and holding all at cellar temperature until enough was secured for a churning; if not sour enough then, ripening by warming to 75° until 0.5 per cent of acid was developed, and then churning. (4) Holding the gatherings at 55° until enough was secured for a churning. Methods 1, 2, and 3 proved to be superior to method 4 in securing a good quality of butter. For keeping quality the butters from methods 1 and 2 were much superior to those from 3 and 4, probably due to a better control of the desirable types of bacteria.

It was found that the mottles in butter largely disappear after about 16 to 20 workings on the board and that the body of the butter is much better than with a lesser number of workings, being closer in texture and carrying less loose water. The grittiness of salt disappears at about 16 to 20 revolutions of the worker, this fact showing that about that amount of working is necessary properly to incorporate and to secure uniformity in the distribution of the salt. Temperature, grade of salt, and quality of butter fat will affect the working requirements of the butter.

If considered desirable, a high moisture content can be secured as well in farm butter as in creamery butter if care is used in regulating the period of churning as well as the temperatures used. With the common, hand butter worker, moisture is gradually lost as the working progresses, while with the combined churn the moisture increases after a certain period in working the butter. The moisture content rose in all cases where the butter was worked from 8 to 12 times. It is thought that at this point the salt began to be uniformly distributed through the butter and acted momentarily to delay the working out of the moisture.

Directions and methods for making uniform dairy butter of good quality are suggested.

VETERINARY MEDICINE.

Report of the division of veterinary science, G. A. ROBERTS (*North Carolina Sta. Bien. Rpt. 1913–14, pp. 28–30*).—This report of work of the veterinary department consists largely of a brief statement of experimental work with cotton-seed meal and means for neutralizing its toxic effect upon hogs and other animals, in continuation of work previously noted (E. S. R., 29, p. 77).

A study was made of the clinical symptoms in 212 rabbits and 46 swine, some of which had been fed cotton-seed meal with an iron salt or with wood ashes as a corrective. Both of these agents proved to be very efficient in overcoming the usual ill effects.

"The most characteristic clinical symptoms in swine, as noted from the beginning of our experiments in feeding cotton-seed meal, have been rather firm feces (though diarrhea was present in a few cases); rough, coarse hair, indicating unthrift; irregular or loss of appetite, especially for the cotton-seed meal; weakness; unsteady gait; more or less loss of sight and very difficult breathing. Animals would finally get down, unable to rise, and lie there either

in a comatose condition or in a constant struggle to regain their feet, often grunting as if in pain or distress. Death would follow in a few hours to several days. Many animals, however, that appeared hale and hearty at the evening meal were found dead the following morning. The most conspicuous symptoms in rabbits and guinea pigs consisted of rapid breathing, lassitude, prostration, and death in a few hours. Sometimes there were continuous movements of limbs after prostration as if to regain their feet, while in others there were no such movements.

"A comparative study of some of the characteristics of blood from swine fed cotton-seed meal with and without correctives was made. This examination was suggested by the frequency in which dirt, sand, and gravel were found in stomach and intestines at autopsy of swine dead of cotton-seed meal feeding and in the light of the beneficial effects of iron and wood ashes when fed with the cotton-seed meal. . . . As regards the variations of hemoglobin and also of the other characteristics of blood, they were as great among individuals of the same lot as between those of different lots. These results bear out former observations that cotton-seed meal has little apparent effect upon the above-mentioned features of the blood.

"Autopsies were held upon 72 rabbits and 13 swine. . . . Little difference in any of the lesions found in the various lots was noted, except the absence of thrombi (ante mortem clots) in all of the six deaths on iron. The most frequent lesions found upon autopsy of animals dead from cotton-seed meal feeding were as previously noted in a former annual report, namely, excess chest and abdominal fluids, congestion of various organs, more or less edema of lungs and frequent thrombi (ante mortem clots) in the heart. The principal difference in the lesions of rabbits and guinea pigs, contrasted with those of swine, consisted in the greater excess of abdominal fluid over the chest fluid of the former while the reverse was true of the latter. . . .

"The yellow jasmine was found to be the cause of death of a number of cattle."

Sugar beet poisoning, B. F. KAUPP (*Amer. Vet. Rev., 47 (1915), No. 4, pp. 458–462*).—The author reports upon observations of sugar beet poisoning in live stock made while pathologist at the Colorado Experiment Station. It is pointed out that while tops, beet pulp, mangel wurzels, etc., furnish extra feed if fed judiciously, only a part of the animal's ration should consist of them. Sugar beet pulp fed gradually in excess for long periods causes fatty degeneration, especially of the liver and kidneys, and excessive feeding of beets and beet tops may cause gastroenteritis with parenchymatous degeneration of the liver and kidneys.

A contribution to the practical utility of Abderhalden's dialysis procedure for the early diagnosis of pregnancy, H. RAEBIGER, E. WIEGERT, E. SEIBOLD, and A. ROECKE (*Berlin. Tierärztl. Wchnschr., 31 (1915), No. 8, pp. 85–91*).—Fifty-two sera (47 from bovines and 5 from horses) were examined, 25 of which (24 from bovines and 1 from horse) were obtained from slaughterhouses. The remaining 27 sera were sent in from breeding establishments by veterinarians and included 23 bovines and 4 horses, 20 of these animals being pronounced pregnant by clinical examination, and no history of pregnancy in the remaining 7 being obtainable.

The examination of blood samples from the slaughterhouse showed positive in 22 cases. In the remaining 27 blood samples 3 gave an erroneous diagnosis with the method, but 2 of these cases, three and a half months later, gave a correct result. The author is of the opinion that results may be obtained by the Abderhalden method which will be of value in practice.

Diagnosis of pregnancy, tuberculosis, and other diseases in domestic animals, W. PFEILER (*Berlin. Tierärztl. Wchnschr., 31 (1915), No. 10, p. 112*).—The sera of 150 bovines (54 pregnant and 96 nongravid) were examined by the Abderhalden procedure. Of the 54 sera from pregnant animals only 32 showed positive and in 5 the results were uncertain because the sera contained dialyzable substances themselves. Of the 96 sera coming from nonpregnant subjects, 44 gave a negative reaction and 11 doubtful reactions. The method showed positive in 19 out of 27 sera from tuberculous animals, and in 1 case the results were doubtful. With 54 sera of nontuberculosis animals the reaction was paradoxical in 27 cases and doubtful in 11 cases.

Thirty-three sera coming from 29 nongravid and 4 gravid horses were examined. Of the 29 coming from nongravid animals 8 gave a correct and 19 a paradoxical result and 2 doubtful results. With the 4 pregnant animals 2 sera gave correct results and 2 doubtful results.

Two pregnant swine yielded doubtful results. With the sera from 2 hogs affected with cholera and one from an immune animal, 1 gave a positive and 1 doubtful, and the immune serum gave paradoxical results. With 5 normal hog sera the results were all erroneous.

Sera from glandered horses strongly cleaved organs of glandered animals and healthy guinea-pig tissue. The organs from animals affected with erysipelas, placenta, healthy liver, and other healthy organs were cleaved by erysipelas immune and normal sera.

Some data obtained with the sera from 5 human subjects affected with cancer, pregnant, or normal are also included.

Remarks and contribution to anthrax diagnosis, BLAU (*Berlin. Tierärztl. Wchnschr., 31 (1915), No. 4, pp. 37–41*).—A review of the facts pertaining to the methods in use to-day for diagnosing anthrax. The factors which influence the results, especially those which are liable to lead one to error, are mentioned.

Contribution on the serodiagnosis of glanders, W. PFEILER and F. SCHEFFLER (*Berlin. Tierärztl. Wchnschr., 30 (1914), Nos. 45, pp. 741–743; 49, pp. 789–794*).—The authors maintain that with the conglutination reaction one can undoubtedly diagnose cases which can not be found by the agglutination, complement fixation, or clinical examination methods. It can also be used for diagnosing glanders in asses. It is not deemed possible by the agglutination and complement-fixation methods to distinguish between horses affected with glanders and those treated with mallein, but this is possible with the conglutination method.

The serodiagnosis of glanders in the Dutch East Indies, C. BUBBERMAN (*Deut. Tierärztl. Wchnschr., 22 (1914), No. 29, pp. 464–466*).—The author concludes that the complement-fixation test, generally speaking, yields better results than the agglutination test. Where complement is fixed with 0.1 cc. of horse serum the test must be regarded as positive, and weakly positive if fixation is obtained with up to 0.2 cc. of serum. If the binding is incomplete with 0.2 cc. of the serum, disease is not present in the animal.

The complement fixation test can not be used for noting recent infections, but in these cases the agglutination test will give the desired results.

The diagnostic value of blood examination in glanders, A. MARCIS (*Allatorvosi Lapok, 37 (1914), No. 22, pp. 261–265; abs. in Deut. Tierärztl. Wchnschr., 22 (1914), No. 29, pp. 466, 467*).—Investigation of artificially and naturally infected horses showed that the specific agglutinins are present on the fifth day post-infection, and complement-fixing substance on the seventh day. See also a previous note (E. S. R., 30, p. 881).

As an antigen in the complement-fixation test an emulsion of glanders bacilli is preferred, but antiformin bacillary extract, according to Altmann and

Schultz, or 5 per cent mallein can be employed. The complement fixation test yielded more reliable results than the agglutination or precipitation methods. When practicable, it is deemed advisable to carry out the three tests on the same blood sample, especially when questionable results are obtained by the complement-fixation test. If from 0.2 to 0.1 cc. of blood serum causes fixation, glanders is present. Where partial fixation occurs the complement-fixation test should be repeated, provided a negative reaction is obtained with the agglutination test.

Out of 150 horses destroyed on the basis of two positive thermal reactions the three serodiagnostic tests showed glanders 132 times, in one case glanders was suspected, and 17 cases were negative. Among the 17 negative cases, however, there were found 9 animals with caseous and calcified nodules which could not be positively recognized to be of a glanderous nature, and in 6 animals acute glanders was found three to four weeks after the examination. Out of 25 horses found glandered on autopsy 18 had given negative mallein tests, 20 were declared glandered by the serodiagnostic test, and one doubtful.

Tuberculosis in the ass, M. SCHLEGEL (*Berlin. Tierärztl. Wchnschr., 30 (1914), No. 48, pp. 777–779*).—A comparatively complete description of tuberculosis in a ten-year-old gelding ass and a discussion of the existing literature in regard to tuberculosis in this kind of animal.

Immunizing tests on guinea pigs with tubercle bacilli dissolved by lecithin, E. A. LINDEMANN (*Centbl. Bakt.* [*etc.*], *1. Abt., Orig., 74 (1914), No. 7, pp. 624–634*).—The favorable results reported by Deycke and Much (E. S. R., 22, p. 184; 25, pp. 87, 886) could not be confirmed in this investigation. In no case was an immunity obtained.

Abortin, C. HAASE (*Berlin. Tierärztl. Wchnschr., 31 (1915), No. 3, p. 29*).—Twelve healthy pregnant cows were given protective treatment and four curative treatments. The results obtained are considered favorable.

Piroplasmosis in cattle in Hungary in 1913 and means of control, K. WOLLÁK (*Állatorvosi Lapok, 37 (1914), No. 33, pp. 387–389; abs. in Internat. Inst. Agr.* [*Rome*], *Mo. Bul. Agr. Intel. and Plant Diseases, 5 (1914), No. 12, pp. 1615, 1616*).—It is stated that this disease of cattle is relatively rare in Hungary and appears to be restricted to the wooded regions of the Northeast. It has, however, appeared of late years in the country on the left bank of the Tisza, where it sometimes takes a virulent form.

The daily administration of a mixture of 1 gm. of powdered arsenious acid, 10 gm. of powdered calamus root, and 10 gm. of sulphate of iron in a small ration of bran is thought to have had a valuable curative action.

The hog cholera question, with particular reference to shoat typhoid, R. STANDFUSS (*Ztschr. Infektionskrank. u. Hyg. Haustiere, 16 (1915), No. 6, pp. 459–469, fig. 1*).—The etiology and the clinical and patho-anatomical appearances of hog cholera and "Ferkeltyphus" are considered. The author thinks that for the present hog cholera should be referred to without giving the secondary infection a separate name; that shoat typhoid should be separated therefrom.

Remarks on the hog cholera question.—II, Concerning shoat typhoid, E. JOEST (*Ztschr. Infektionskrank. u. Hyg. Haustiere, 16 (1915), No. 6, pp. 470–482*).—A further discussion (E. S. R., 33, p. 285), with reference to the paper by Standfuss above noted.

Facts about so-called hog cholera cures and specifics, C. H. STANGE and C. G. COLE (*Iowa Sta. Circ. 25 (1915), pp. 6*).—This circular reports tests made of seven different so-called hog cholera cures and specifics, none of which was found to be of value. The products thus tested are Cholera Immune U. S. Specific, American Specific No. 2, Co-Vac-O, No. 544 Curative, No. 544 Immunizing, De Vaux Cholera Antitoxin, and Dr. D. W. Nolan's Anti-Hog-

Cholera Specific (Noxine). Hog cholera serum used as a check gave satisfactory results.

The biology of trichina, P. J. SCHMIDT, A. PONOMARER, and MISS F. SAVELIER (*Compt. Rend. Soc. Biol. [Paris], 78 (1915), No. 10, pp. 306, 307*).—This is a preliminary report of experimental studies made of *Trichinella spiralis* at the zoological laboratory of the agricultural school at Petrograd.

In studies of the effect of low temperatures it was found that 0° did not have any effect upon the vitality of the encysted trichina, even if continued for a period of eleven days, and a temperature of —6° C. was endured by the trichina for a period of ten days. A temperature of —9° was sometimes fatal to trichina but not always, whereas a temperature of —15 to —16° was always fatal. The attempted culture of the trichina artificially has given negative results.

The etiology of pyemic arthritis in foals, F. W. SCHOFIELD (*Amer. Vet. Rev., 47 (1915), No. 6, pp. 695–703*).—Previously noted from another source (E. S. R., 31, p. 887).

Investigations of a disease of pigeons in which Bacillus paratyphosus B was found, M. ZINGLE (*Ztschr. Infektionskrank. u. Hyg. Haustiere, 15 (1914), No. 3–4. pp. 268–272, fig. 1*).—In investigations of an outbreak of disease among pigeons at Strassburg, the author isolated a bacillus from the blood, the muscles, and the organs which was identified culturally, morphologically, and serologically as *B. paratyphosus* B.

Diphtheria bacilli in birds, R. SPIEGELBERG (*Centbl. Bakt. [etc.]. 1. Abt., Orig., 75 (1915), No. 4, pp. 273–288; abs. in Berlin. Tierärztl. Wchnschr., 31 (1915), No. 13, p. 150*).—Bacteria simulating the diphtheria bacilli were noted in diseased and healthy pigeons and also in healthy chickens.

RURAL ENGINEERING.

A treatise on water supply, A. FRIEDRICH (*Kulturtechnischer Wasserbau. Berlin: Paul Parey, 1912, vol. 1, 3. ed., pp. XVI+650, pls. 24, figs. 511*).—This is the first volumne, third edition, of a handbook intended mainly for the use of agricultural engineers. The second volume has already been noted (E. S. R., 32, p. 87).

The main subjects covered in this volume are technical soil improvement; hydrometry; soil formation, conservation, and cultivation; soil drainage; irrigation; and completed drainage and irrigation systems. The physics and mechanics of soils and soil formation are dealt with in considerable detail in the first sections. A large amount of working data on the conservation and use of surface and ground water and on methods of cultivation, prevention of erosion, etc., is given. The final sections deal with the different phases of drainage and irrigation, including much working data of an engineering nature.

Good water for farm homes, A. W. FREEMAN (*Pub. Health Serv. U. S., Pub. Health Bul. 70 (1915), pp. 16, figs. 6*).—This bulletin deals with the sanitary aspects of farm water supplies, describing insanitary well and spring conditions and suggesting remedies. Methods of protecting wells and springs are given particular attention, and it is stated that in the event that pure water can not be obtained for drinking purposes impure water may be purified by boiling or by treating with chlorid of lime. "The chlorid of lime solution is prepared by dissolving one teaspoonful of fresh chlorid of lime (bleaching powder) in 1 qt. of water. This should be placed in a tightly stoppered bottle and kept away from light. To disinfect water, add one teaspoonful of the

disinfectant solution so prepared to each 2 gal. of water, stir the water thoroughly and allow it to stand for fifteen minutes. At the end of that time the disinfectant will have killed the disease germs and the water may be drunk with a fair degree of safety."

Water supply (*Bul. Kans. Bd. Health, 11 (1915), No. 5, pp. 145–149, figs. 3*).—As a part of a sanitary survey of the farm premises of Sumner County, Kans., analyses were made of 479 samples of water taken from different representative wells of the county and 145 samples of cistern water.

Of the dug well waters 22.3 per cent were good, 8.7 per cent doubtful, and 69 per cent bad. Of the driven well waters 78.7 per cent were good, 8.1 per cent doubtful, and 13.2 per cent bad. Of the drilled well waters 55 per cent were good, 15 per cent doubtful, and 30 per cent bad. Of the cistern waters 31.6 per cent were good, 13.1 per cent doubtful, and 54.3 per cent bad, and of the cistern waters 65 per cent of those pumped, 44 per cent of those chain pumped, and 77 per cent of those raised by bucket were bad. The opinion is expressed that charcoal filters for cisterns on farms are useless. "The average charcoal filter may, if properly cared for, have some efficiency; but only a very small percentage are properly cared for. The remainder accomplish only one end and that is the concentration of pollution by holding it from one rain to the next."

Biochemical and engineering aspects of sanitary water supply, G. W. FULLER (*Jour. Franklin Inst., 180 (1915), No. 1, pp. 17–61, figs. 7*).—This article deals more particularly with the biological than with the chemical phases of the sanitary features of water supplies.

Water power on the farm, R. STANFIELD (*Trans. Highland and Agr. Soc. Scot., 5. ser., 27 (1915), pp. 192–211, figs. 11*).—This article gives a simple explanation of methods to be adopted in ascertaining the possibilities of power development by means of a given supply of water, and describes various types of water wheels, turbines, and water-power installations.

Surface water supply of the south Atlantic and eastern Gulf of Mexico basins, 1913 (*U. S. Geol. Survey, Water-Supply Paper 352 (1915), pp. 84, pls. 3*).—This report presents the results of measurements of flow made on streams in the south Atlantic and eastern Gulf of Mexico drainage basins during 1913.

Profile surveys in Chelan and Methow River basins, Washington (*U. S. Geol. Survey, Water-Supply Paper 376 (1915), pp. 8, pls. 5*).—This pamphlet, prepared in cooperation with the State of Washington under the direction of R. B. Marshall, describes the general features and gives plans and profiles of streams in the Chelan and Methow River basins.

Profile surveys in 1914 in Umpqua River basin, Oregon (*U. S. Geol. Survey, Water-Supply Paper 379 (1915), pp. 7, pls. 13*).—This paper, prepared in cooperation with the State of Oregon, under the direction of R. B. Marshall, describes the general features of the Umpqua River basin and gives plans and profiles resulting from surveys of streams in the basin during 1914.

Daily river stages at river gage stations on the principal rivers of the United States, 1911 and 1912, A. J. HENRY (*U. S. Dept. Agr., Weather Bur., Daily River Stages, 1911–12, pt. 11, pp. 380*).—This paper is the eleventh part of a series of river gage readings and covers work for 1911 and 1912.

Daily river stages at river gage stations on the principal rivers of the United States, 1913 and 1914, A. J. HENRY (*U. S. Dept. Agr., Weather Bur., Daily River Stages, 1913–14, pt. 12, pp. 400*).—This paper constitutes the twelfth part of a series of river gage readings and covers work for 1913 and 1914.

Equipment for current-meter gaging stations, G. J. LYON (*U. S. Geol. Survey, Water-Supply Paper 371 (1915), pp. 64, pls. 37, figs. 10*).—This report

includes what is considered to be the latest and best available information in regard to the following: (1) Gages for determining fluctuations of stage, (2) bench marks for referring the gages to a fixed datum, (3) structures from which discharge measurements are made, (4) cable and stay line to hold the meter in a vertical position when soundings and velocity observations are made, (5) graduated lines to indicate the points of measurement, and (6) artificial structures, at places where natural control is ineffective, to regulate the relation between stage and discharge. Suggestions from several hydraulic engineers regarding these points are also included.

Final report of the construction Tumalo irrigation project to the Desert Land Board, State of Oregon, O. LAURGAARD (*Laidlaw, Oreg.: Desert Land Board, 1914, pp. [V]+90, pls. 14*).—This report covers the history, organization, and construction of this irrigation project, the last being dealt with in considerable detail.

Annual irrigation revenue report for the year 1913–14 (*Rev. Rpt. Bihar and Orissa [India], Irrig. Branch, 1913–14, pp. II+154, pls. 8*).—This report gives data on irrigation, operation, expenditures, and revenues for the year 1913–14.

Two large irrigation projects in Russia, I, M. NIKOLITCH (*Engin. News, 74 (1915), No. 1, pp. 8–11, figs. 4*).—This article describes the history and construction of the Golodnaya irrigation project, on the Golodnaya Steppe, in Turkestan, which at present reclaims 125,000 acres of land. This project is a relatively simple one, consisting of head gates, 32.6 miles of main canals, 110 miles of distributing and main drainage canals, and 780 miles of laterals and secondary drainage canals. The water supply is diverted from the Sir-Daria River, which rises in the mountains of the Central Tian-shan.

Two large irrigation projects in Russia, II, M. NIKOLITCH (*Engin. News, 74 (1915), No. 3, pp. 102–104, figs. 3*).—This article describes the second of the two large Russian irrigation projects. The Mugan Steppe project covers 465,000 acres of land bordering on the Caspian Sea and consists of four independent canal systems and extensive drainage works. The water supply is from the Arrax River, which is said to present river-control problems similar to the Colorado River in its relation to the Imperial Valley, in southern California.

Contribution to the study of irrigation in the Canton of Valais, P. CHAVAN (*Ann. Agr. Suisse, 16 (1915), No. 1, pp. 1–71, figs. 12*).—This report presents the results of a study of irrigation economics, irrigation engineering, and irrigation farming in the Canton of Valais, Switzerland.

It is pointed out that the climate and the geological nature of the soils make irrigation necessary and that it is made possible by the numerous rivers and streams of glacial origin. It has been found that irrigation has been of great social and economic importance. Irrigation costs, on the whole, from 20 to 25 francs per hectare ($1.56 to $1.95 per acre), which expense is said to be easily met by the increased profits from soil which is otherwise unproductive.

Chemical analyses of irrigation water from the calcareous "High Alps" show a high content of calcium carbonate, sulphates, and magnesia. Fertilizer experiments on soils irrigated with this water indicate that potassic and phosphatic fertilizers may be profitably used. Analyses of irrigation water rising from primitive rock regions show a high content of potassium. The fertilizer experiments show that where this water is used potash fertilizers are not needed.

Irrigation water is supplied to cultivated fields, meadows, pastures, and vineyards by a network of canals totaling 1,400 km. (870 miles) in length which follow in general the grade of the Rhone Valley. Much water is lost by percolation and evaporation in transport, and canal improvements are considered necessary.

Hydrostatic catenary flume on a concrete aqueduct, H. B. Muckleston (*Engin. News, 74* (*1915*), *No. 2, pp. 58–63, figs. 9*).—The details of the design and construction of a reinforced concrete viaduct nearly 2 miles long, carrying a trough flume in the shape of a hydrostatic catenary, are given. This structure is part of a Canadian irrigation scheme and carries on hydraulic gradient a maximum flow of 900 second-feet.

Cost of electric pumping for irrigation (*Elect. World, 66* (*1915*), *No. 2, pp. 68–71, figs. 9*).—Results extending over six years, obtained on the south side unit of the Minidoka project of the U. S. Reclamation Service, are reported.

Water is raised by large pumping stations up three 30-ft. steps. At each level some water is taken out for the lands that can be covered. The power required is the same as though all the water were lifted to an average of from 66 to 69 ft. Electricity is supplied from a power plant utilizing a 46-ft. fall in the Snake River at Minidoka Dam. Energy is transmitted about eleven miles from the power house to the pumping stations over 33,000-volt transmission lines, and supplied to the pumping station at cost. The unit of cost for operation, maintenance, and depreciation has been taken as the acre-foot lifted 1 ft. high or the so-called "foot-acre-foot." Beginning with the year 1909 and including the year 1914 the total annual cost for operation, maintenance, and depreciation per foot-acre-foot for the six years in succession was \$0.00626, \$0.00473, \$0.00385, \$0.00491, \$0.00371, and \$0.00317.

Why drainage of irrigated lands is necessary and how the problem is handled, D. W. Murphy (*Engin. Rec., 72* (*1915*), *No. 2, pp. 36–38, figs. 2*).—It is pointed out in this article that leakage from canals and extensive use of water for crops cause saturation of the subsoil and the deposition of alkali on the ground surface. The fundamental purpose of drainage works is considered to be to control the ground-water table and prevent its rising high enough to impair the irrigability of the soil, either through saturation or through the accumulation of alkali. "Drainage works must be so located and constructed that they will be effective in skimming off or disposing of the top portion of the ground waters over those areas where there is a tendency for them to reach the surface." The determination of location, type, and depth of drains to be used is said to depend on local conditions in each particular case, and can be determined only after careful investigations and study of the character of the subsoils and the ground-water movement through them.

Superelevation of curves on highways, Illinois practice, H. E. Bilger (*Engin. News, 74* (*1915*), *No. 2, pp. 74, 75*).—Where brick and concrete roads are used almost exclusively it is stated that, "all matters considered, the most satisfactory treatment of these types on curves is to carry the profile of the center line and of the inner edge of the pavement around the curve without a break, but to elevate the outer longitudinal half of the slab 2 in. for the 10-ft. pavements and 4 in. for the 18-ft. ones. On the inner as well as the outer longitudinal half of the slab the convexity of the surface should be avoided, to the end that the entire portion of the slab that comes upon the curve may be a surface having a straight-line top on any cross section. Gravel and macadam road surfaces should be similarly treated on curves . . . by elevating the outer longitudinal half of the metaled way by an amount equal to twice the crown on tangents for the particular type in question."

Limestone road materials of Wisconsin, W. O. Hotchkiss and E. Steidtmann (*Wis. Geol. and Nat. Hist. Survey Bul. 34* (*1914*), *Econ. Ser. 16, pp. VIII+137, pls. 41, figs. 2*).—This report deals with the origin, extent, distribution, and general characteristics of Wisconsin road materials, and gives a description of these by counties.

The road materials of Wisconsin consist of gravel and field stone, limestone, granite and trap rock, sandstone, and quartzite. There is great variation in the quality of these materials. Some limestones of the State are absolutely unfit for use on the roads, others can be used only with very careful treatment in construction, but most of them make a satisfactory road material. The granites and trap rocks also vary greatly in character, but all are good. The most variable road material in the State, and one of the most valuable, is the gravel. This material is so extremely diverse in character that the method of treatment adapted to material from one end of a single pit may not be at all suitable for material from the other end. The limestones furnish the greatest amount of crushed stone for road purposes in the State and are the only type of road material considered in detail in this report. Tests of road material as conducted by the Office of Public Roads of this Department are also described.

Gravel aggregate for concrete, W. K. HATT (*Municipal Engin., 49 (1915), No. 1, pp. 2–8, figs. 10*).—Tests to ascertain the relative strength of concrete of an arbitrary 1:2:4 proportion, when the line of division between the fine and coarse aggregates is the $\frac{1}{8}$-in. sieve and when it is the $\frac{1}{4}$-in. sieve, are reported. It is concluded from the results that for the aggregates tested and the assumed proportion the resulting concrete is as strong, if not stronger, when the line of division is on the $\frac{1}{8}$-in. screen.

Investigation of the effects of alkali on concrete drain tile near Lake Park, Iowa, C. E. SIMS and G. P. DIECKMAN (*Concrete-Cement Age, 6 (1915), No. 6, pp. 278–281*).—An investigation of the failure of concrete drain tile in soils containing appreciable quantities of calcium and magnesium sulphates led to the conclusion that the use of good materials in proper proportions to make dense concrete, compacting the mixture well, and aging the product for a month at a temperature above freezing will protect the concrete tile against alkali. "Knowing that concrete becomes more dense with age, it seems that if the absorption is less than 5 per cent in concrete thirty days old it ought to be alkali proof and suitable for any service."

Report committee on electricity on the farm, Western States (*[Nat. Elect. Light Assoc., 1912–13], Manuscript, pp. 14*).—This report presents the substance of answers to inquiries sent out by the National Electric Light Association to different power companies in the Western States to obtain information as to the farm use of electricity.

The answers indicate that the use of electricity for agricultural purposes in the West is most extensive in the States of Washington, Oregon, California, and Colorado, while interest is manifested in several other States. "The most interesting thing brought out was the great difference in the method of charging for the power and the amount of the charge. . . . The use of electricity on the farm is necessarily a seasonal use, the greatest demand being for pumping for irrigation. Depending on the locality and on the crop to be irrigated, the irrigating season under normal conditions is from April to October, inclusive. A dry year, such as has just been experienced in California, will make the season longer. . . . It is very apparent, therefore, that it is to the power company's advantage to have the consumer make his installation as small as possible and operate as many hours per day as possible."

Copies of agricultural rate schedules from various companies operating in the different States are appended.

Priming a centrifugal pump, E. M. IVENS (*Power, 41 (1915), No. 26, pp. 880–882, figs. 8*).—Several methods of priming centrifugal pumps and of overcoming priming troubles are described with illustrations.

The proposed standardization of farm wagons (*Farm Machinery, No. 1239 (1915), pp. 18, 19*).—A plan for the standardization of farm wagons approved by the National Implement and Vehicle Association is given. The purpose of the effort at standardization and simplification of wagons is to produce an interchangeable line of wagon parts which will permit the dealer and manufacturer to serve the farmer quicker and better. The standardization is confined to 2-horse wagons for farm, ranch, and mountain use and does not consider 1-horse wagons, farm trucks, or gears for special purposes. With this in view all gears with skeins larger than 3¾ in. and with steel axles larger than 2¼ in. have been counted as belonging to the special teaming gear class.

Tests of potato planters, potato diggers, and grain driers and preliminary examinations of new implements, G. Fischer et al. (*Arb. Deut. Landw. Gesell., No. 265 (1914), pp. 173, figs. 95*).—A number of tests of different commercial makes of potato planting and harvesting machinery and grain driers are reported, together with the results of preliminary examinations of a number of different agricultural implements.

Methods used in constructing a 108-ft. monolithic concrete silo near Salona, Pennsylvania (*Concrete-Cement Age, 6 (1915), No. 6, pp. 301, 302, figs. 3*).—The details of the construction of this silo are presented.

Methods and costs in constructing a combined concrete silo and water tank (*Concrete-Cement Age, 6 (1915), No. 3, pp. 162–164, figs. 7*).—The details of this structure are illustrated and described.

Heating greenhouses by hot water, G. W. Loeber (*Dom. Engin., 70 (1915), No. 13, pp. 399–401, figs. 4; 71 (1915), Nos. 2, pp. 31–33, figs. 7; 5, pp. 124–136, figs. 3, 9, pp. 244, 245, figs. 2; 13, pp. 362–366, figs. 3*).—This article gives a detailed description, with illustrations, of how to install hot water heating systems in greenhouses, dealing with the open tank, closed pressure, and forced circulation systems.

Safe disposal of human excreta at unsewered homes, L. L. Lumsden, C. W. Stiles, and A. W. Freeman (*Pub. Health Serv. U. S., Pub. Health Bul. 68 (1915), pp. 28, figs. 13*).—In this bulletin, after discussing some of the serious diseases affecting the human race with reference to their distribution in human excreta, it is stated "that human excreta, if not prevented from reaching human bodies, constitute the most dangerous of all matter with which we are liable to come into contact in the course of our daily lives." As methods for the disposal of human filth, different types of sanitary privies are described and illustrated, including the well-known L. R. S. type (E. S. R., 25, p. 891).

It is stated in conclusion that "the proper disposal of human excreta can not be accomplished without some labor and expense, but the return in cleanliness, comfort, and health make an intelligent expenditure of labor and money for such a purpose one of the best possible investments."

The danger zone on the farm. Sewage disposal (*Va. Health Bul., 7 (1915), No. 6, pp. 247–262, figs. 8*).—This bulletin describes and illustrates different types of sanitary privies, including the pail and pit types and the Kentucky sanitary privy, and also briefly describes and illustrates a small sewage-disposal system consisting of a septic tank and a subsurface irrigation system. Bills of material are included.

Three residential sewage-treatment plants near Cleveland, R. F. MacDowell (*Engin. News, 74 (1915), No. 2, pp. 56, 57*).—Three small residential sewage-treatment plants of different design are described comprising (1) a two-story sedimentation tank and glass-covered rapid sand filters, (2) screens, a two-story sedimentation tank, a dosing tank, and intermittent sand filters, and (3) a septic tank, dosing tank, and subsurface irrigation system. It is stated that

all three plants have operated successfully and have produced effluents of satisfactory character.

A summary of the results of experiments on the purification of creamery refuse and their application, H. R. Crohurst and A. D. Weston (*Engin. and Contract., 44 (1915), No. 1, pp. 7–9*).—This article summarizes data and conclusions obtained in experiment stations in this country and in Europe on the subject of creamery refuse disposal.

It is stated that the wastes produced in the dairy industry consist chiefly of dilute solutions of milk in which are particles of butter, fat, and casein which come from the washing of the products, utensils, and floors. The waste is very susceptible to bacterial action, quickly becomes acid, containing approximately 1,000 parts per million acidity, and gives rise to very disagreeable odors due to the production of butyric acid. Because of the high oxygen demand it creates a nuisance when discharged into small streams by quickly using up the available oxygen, after which putrefaction begins.

From the available data the following methods of purification are suggested as the result of experiments: "Where the volume of the waste is comparatively small and suitable land is available it may be disposed of by irrigation at rates varying from 20,000 to 2,000 gal. per acre per day. If suitable land is not available one of the following biological methods is suggested: Sedimentation in septic tanks for from two to ten days and, if diluting water in sufficient volume is at hand, disposal by dilution; sedimentation in a septic tank for from two to ten days, followed by filtration through sand at rates not to exceed 25,000 gal. per acre per day (where sand treatment is employed it is recommended that the acidity be reduced by the addition of lime so that bacterial action will not be retarded); sedimentation in septic tanks for from two to ten days, followed by treatment in primary contact beds, and if necessary by secondary contact beds or trickling filters (trickling filter treatment following sedimentation is not recommended because of the dispersion of odors in applying the liquid after sedimentation to the surface of the filter). . . .

"It is felt that any of the above methods of treatment will produce an effluent which will not give rise to a nuisance when discharged into a small stream or brook."

RURAL ECONOMICS.

Farming and food supplies in time of war, R. H. Rew (*Jour. Bd. Agr. [London], 22 (1915), No. 6, pp. 504–520; Nature [London], 96 (1915), No. 2399, pp. 216–220; Science, n. ser., 42 (1915), No. 1084, pp. 475–486*).—This paper treats of the relation of the total consumption to the home production and the influence of war on this relationship. The following table indicates the sources of the food supply of the United Kingdom:

Sources of food stuffs consumed in the United Kingdom, 1910–1914

Source of supply.	Wheat.	Meat.	Poultry.	Eggs.	Butter.[1]	Cheese.	Milk.[2]	Fruit.	Vegetables.
	P. ct.	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*	*P. ct.*
United Kingdom	19.0	57.9	82.7	67.6	25.1	19.5	95.4	36.3	91.8
British Empire overseas	39.3	10.7	0.2	0.1	13.3	65.4	....	8.3	1.1
Foreign countries	41.7	31.4	17.1	32.3	61.6	15.1	4.6	55.4	7.1

[1] Including margarin. [2] Including cream.

A comparison of the imports in 1913–14 with 1914–15 shows that there was a decrease of 1.39 per cent in the receipts of wheat, including flour, 11.97 per cent decrease in the receipts of meat, 8.67 per cent decrease for sugar, and 6.47 per cent decrease for butter. For bacon and hams, cheese, fruits, and rice there was an increase.

Systems of farming and the production of food—the need for more tillage, T. H. MIDDLETON (*Jour. Bd. Agr. [London], 22 (1915), No. 6, pp. 520–533*).—The author has restricted his discussion to three systems of farming: (1) The production of meat on grass land, (2) the production of milk on grass land, and (3) the production of food crops and meat from arable land. The unit of measurement used to indicate the efficiency of the different systems was the energy value for a day's rations of a man. The meat produced on an acre of poor pasture will supply 11 days' rations for a man, on rich pasture 140; dairy farming on good grass, 193 days' rations; and mixed arable farming on good land 296 days' rations.

The land question and the condition of agricultural labor (*Final Rpt. Com. Indus. Relations [U. S.], 1915, pp. 127–132*).—As a result of its study of tenancy in the Southwestern States, the commission recommends that there be developed through legislation a long-time farm lease which will give fair rents, security of tenure, and protection of the interests of the tenant in the matter of such improvements as he may make on a leasehold in his possession; also that national and state land commissions be organized to act as land courts with powers to hear evidence given by landlords and tenants as to questions that have to do with fair rents, fixity of tenure, and improvements made by tenants on landlords' property. These commissions should also operate farm bureaus to act as agents between landlords and tenants in the distribution of tenant labor, the preparation of equitable contracts, assist home-seeking farmers, and secure a better distribution of seasonal farm labor.

The development of better credit facilities through the assistance of the Government and the cooperative organization of farmers and tenants is recommended. There should also be modernized rural schools and compulsory education of children, and a revision of the taxation system so as to exempt from taxation all improvements and to tax unused land at its full rental value.

Farmers and farm laborers (*Final Rpt. Com. Indus. Relations [U. S.], 1915, pp. 398–401*).—The commission recommends "that Congress and the various States pass rural credit acts that will give to the small American farmer the same privileges and benefits that for so long a time have been enjoyed by the small farmers in Germany and other European countries, which, following Germany, have adopted rural credit systems. We recommend serious consideration to adapting the Irish land bill and the Australian system of state colonization to our American conditions. It is not our intention, in this report, to enter into minute details as to how this should be carried out. In a general way, however, we believe it not only desirable, but practicable, for the Federal Government, through its Department of Agriculture, and the various States, through their departments of agriculture, to secure large bodies of land at appraised actual values, that have been thoroughly tested by experts for their quality, issuing bonds for the payment for same, if need be, and to cut them up into small parcels, making the necessary improvements, and selling them to qualified colonists with small first payments, making the balance payable in, say, thirty years on the amortization plan, the deferred payments bearing only the same rate of interest that the Government itself is called upon to pay, plus a small addition to cover the cost of government administration. We believe, in this way, the most effective check can be created on the one hand to minimize farm tenancy, and on the other hand to make it possible for the farm laborer and the farm

tenant to become land proprietors. We believe that this, if carried out wisely and intelligently, will have a large share in minimizing industrial unrest and in adding to the wealth of the Nation, both materially and in the quality of its citizenship."

Rural credit, cooperation, and agricultural organization in Europe, R. METCALF and C. G. BLACK (*Olympia, Wash.: Govt., 1915, pp. 293*).—This is a report of the members from the State of Washington of the American Commission which studied rural credit systems of Europe as to their adaptability in the United States and to the agricultural needs of Washington.

The authors discuss agricultural cooperative organizations and credit systems as found in Germany, Italy, Austria, the Balkan States, Russia, Switzerland, Belgium, Holland, Denmark, France, and the United Kingdom, and conclude their study by stating that Washington can probably obtain better credit by adopting the Landschaften system of collective security with the amortization plan of repayment. This system necessitates a guaranty that the security, individual or collective, land or personal, shall not deteriorate in value at any time during the loan. In order to bring this about dairying and raising beef cattle are deemed essential in the grain belt of eastern Washington and the logged-off lands of western Washington. Agricultural education in schools and high schools should be made practical and should receive greater emphasis. Standardizing crops and stock is greatly needed to facilitate the organization of cooperative marketing organizations.

The authors conclude that "whatever rural credit or cooperative organizations may be provided by legislation, the farmers must take the initiative in their creation, must take their management, so that their success and the benefit for the entire State, since what benefits the farmer of necessity benefits the State, may be due to and belong to only the farmers themselves."

Report of the cooperative organization branch [of the Saskatchewan Department of Agriculture] (*Ann. Rpt. Dept. Agr. Saskatchewan, 10 (1914), pp. 188–208, fig. 1*).—In these pages are described the origin of the cooperative organization branch of the department, the agricultural cooperative associations' act, the work of typical purchasing and marketing associations, and the success of the branch in the cooperative marketing of wool. There are also given data showing the number of cooperative organizations and the extent of their transactions.

International annual of agricultural legislation, 1914 (*Inst. Internat. Agr. [Rome], Ann. Internat. Leg. Agr., 4 (1914), pp. LXVIII+1019*).—This volume continues the information previously noted (E. S. R., 33, p. 191), adding later decrees and laws.

[International statistics of agriculture] (*Statis. Jahrb. Deut. Reich, 36 (1915), pp. 22*–30**).—This continues information previously noted (E. S. R., 31, p. 790), adding data for later years.

Monthly crop report (*U. S. Dept. Agr., Mo. Crop Rpt., 1 (1915), No. 5, pp. 41–52, fig. 1*).—This number gives the usual monthly estimates of the acreage, condition, and yield of the more important agricultural crops, the farm prices of important products, and the range of prices at important markets, with miscellaneous data on honey production, cranberry and hop conditions, dried apple exports, acreage of red clover, etc.

It is estimated that the total acreage of "wild," "salt," or "prairie" hay, that is, hay cut from uncultivated lands, is 17,000,000 acres, and the average yield for the present season 1.2 tons per acre. The total production of wild hay is approximately one-fourth that of tame.

Reports indicate that the production of wine is being materially curtailed this year, owing principally to large accumulations of supplies carried over from

previous years, and to the possibility of further legislation inimical to this industry. This will result in a large proportion of such wine grapes as are suitable for table use being marketed this year for the latter purpose.

The average moisture content of new oats, as determined by the Office of Grain Standardization, is 15.5 per cent.

Agriculture [in Japan], S. SATO (*Japan Year Book, 1915, pp. 340–360*).—In Japan in 1913 there were 1,441,852 cho (about 3,532,537 acres) in paddy fields and 1,714,693 cho in upland controlled by landowners, and 1,503,737 cho in paddy fields and 1,135,244 cho in upland controlled by tenants. Of the total 5,443,719 farming families, 1,744,801 operated owned land exclusively, 1,520,922 tenanted land exclusively, and 2,177,996 land of both types. Of this total 3,707,088 depended solely upon farming for a living, while 1,736,631 had subsidiary occupations. Of the farming families, 36.79 per cent cultivated farms with an area of less than 0.5 cho, and 33.36 per cent with an area of 0.5 to 1 cho. Additional information is given concerning area in specified crops and number of live stock.

Agricultural statistics of India, 1912–13 (*Agr. Statis. India, 29 (1912–13), II, pp. V+116, pl. 1*).—This report continues data previously noted (E. S. R., 31, p. 491), adding statistics for 1912–13.

AGRICULTURAL EDUCATION.

Report of the Ministry of Industries [of Uruguay] for 1914 (*Mem. Min. Indus. [Montevideo], 1914, pp. 1795, figs. 115*).—This includes a report on the agencies for the promotion of agriculture in Uruguay, the latter including the national inspection service of live stock and agriculture, the National Institute of Agriculture and Agricultural Experiment Station at Sayago, the Veterinary School of Montevideo, the agricultural experiment stations in the Department of Salto at San Antonio and in the Department of Cerro Largo at Banados de Medina and Paysandu, the national nursery for fruit and forest trees at Toledo, including a school for the training of agricultural superintendents or foremen, the model poultry farm at Toledo, and "La Estanzuela" seed breeding farm and model dairy, which is to be developed into a phytotechnical institute. Recent legislation regulating these agencies is appended.

Report of the department of agriculture of Norway for 1914 (*Aarsber. Offentl. Foranst. Landbr. Fremme, 1914, III, Statsforanst., pp. LXI+788, pls. 2, figs. 51*).—This report comprises the usual comprehensive survey of the work of the various government agencies established for the promotion of Norwegian agriculture, including chemical, seed, and milk control stations, agricultural, horticultural, and dairy schools, itinerant instructors, etc.

Agricultural education in the rural schools of Ohio, L. S. IVINS (*Ed. Mo., 1 (1915), No. 7, pp. 252–256*).—This is a review of the present status of agricultural instruction in the rural, elementary, and high schools of Ohio.

The teaching of household management, MYRTIE C. VAN DEUSEN (*Jour. Home Econ., 7 (1915), No. 5, pp. 231–235*).—The author describes the work in the household management course at the State Normal School, Kirksville, Mo.

Relationship of the school garden to the classroom (*Agr. Gaz. Canada, 2 (1915), Nos. 4, pp. 371–375; 5, pp. 461, 462, fig. 1*).—It is maintained that the school garden helps the classroom in the following ways: In giving healthful exercise, vitalizing school work by furnishing concrete material for other subjects, and linking the school to the home; as a workshop or laboratory to be made use of by the teacher in the processes of general education, because of the physical activity, mental development, and esthetic training involved

in its care and construction; and as a means of teaching children the relationship of facts; that is, interpretation, as the result of reflection following observation, which is of more importance than the mere acquirement of facts. The classroom is deemed the best place for the completion of garden work, the teacher directing the processes leading to such understanding by recalling the observations made by the different pupils and by good questioning stimulating reflection, thus leading the pupils to arrive at their own conclusions or else revealing to them the need of making further observations. In beginning the work classroom discussion of plans and objects also helps to give pupils a purpose and point of view which aids them to succeed in the work which they undertake.

Care of school gardens during summer vacation (*Agr. Gaz. Canada, 2 (1915), No. 6, pp. 586–592*).—Among the methods described of caring for school gardens in the summer vacation in the Provinces of Price Edward Island, Quebec, Ontario, Manitoba, and British Columbia the following may be mentioned:

Where teachers are paid a bonus for a well-kept school garden they are held responsible for its vacation care. In several Provinces children must attend to the garden during the summer vacation at regular hours and under the supervision of a teacher, trustee, or farmer, or the community interest is enlisted in the work, parents, trustees, the local branch of the women's institute and ex-pupils being consulted. In some schools committees are appointed for each week of the vacation, each in turn being held responsible for the gardens. In small schools which are far away from the village children harvest their products, consisting of early vegetables, at the end of the school year. Where experience has shown that a garden can not be expected to continue successfully during the vacation it is advised that the ground be seeded down. Competitions and exhibitions, both in rural localities and in towns, have solved the weed problems in hundreds of districts in one Province. In a small garden 3 hours a week, preferably in the morning, has been found sufficient for the work; but in large gardens 8 hours a week may be necessary. One hour a week is usually sufficient for each pupil to spend in actual garden work.

Home projects as an adjunct to agricultural instruction in the school, L. A. DeWolfe and R. P. Steeves (*Agr. Gaz. Canada, 2 (1915), No. 5, pp. 462–464*).—In this discussion the director of elementary agricultural education of Nova Scotia holds that "everything that will help the boys and girls to be self-sustaining and will make them useful and agreeable members of society comes under the head of 'home projects.'" The director of elementary education of New Brunswick recommends that pupils be encouraged to begin home plats under the teacher's supervision in the fall so that this may act as a stimulus in study, observation, and reading during the winter. In his opinion "the connection between education and success, between efficiency and practice, is thus established." Last year 89 home plats were worked by the public-school children of New Brunswick.

"Home credits" for high school work, J. T. Begg (*Better Schools, 1 (1915), No. 7, pp. 101–104*).—In this discussion of home credits the author deprecates the giving of credit for home work which would have a tendency toward making children expect a reward for the performance of their regular duties of life, but approves credit given for out-of-school work in which the principles studied in the classroom are applied.

Outlines for thirty-six lessons in agriculture, W. H. Davis (*Des Moines, Iowa: Dept. Pub. Instr., 1915, pp. 71, figs. 19*).—Instructions are given to teachers and pupils of the seventh and eighth grades for conducting 36 exercises,

each 90 minutes in length and consisting of experiments and recitations in plant processes, weeds, injurious insects, trees, gardens, soils, poultry, and dairy cattle. Lists of references, apparatus, and equipment for agriculture in the grades are included.

Agricultural laboratory manual: Soils, E. S. SELL (*Boston and London: Ginn & Co., 1915, pp. IV+40*).—This is a collection of 40 exercises on soils planned for high schools and normal schools giving instruction in agriculture. The manual consists of 40 sheets, with directions on each for carrying out an exercise, which can be removed from the cover and used separately by students in entering their results and then be rebound. A list of necessary material and apparatus is included.

Suggestive outlines on agricultural and industrial topics for rural and village schools: Corn, L. G. ATHERTON (*Normal Teacher [Madison, S. Dak.], 5 (1915), No. 3, pp. 16, figs. 7*).—This bulletin contains directions for teachers on methods of testing seed corn and selecting corn for seed and exhibition purposes, a brief descriptive list of varieties of corn, and a discussion of silos and silage.

[The preparation and mounting of plants and seeds for class and reference work] (*Agr. Gaz. Canada, 2 (1915), Nos. 4, pp. 377–380, figs. 4; 5, pp. 465–479, figs. 12*).—This is a description of methods of preparing and mounting plants and seeds by officials of the Central Experiment Farm and colleges and schools in the Provinces of New Brunswick, Ontario, Manitoba, Saskatchewan, and Alberta.

Swine judging for beginners, J. S. COFFEY (*Agr. Col. Ext. Bul. [Ohio State Univ.], 10 (1915), No. 11, pp. 15, figs. 12*).—Directions are given for judging swine.

The course of study in household accounting in the Junior High School, McMinnville, Oreg., F. A. SCOFIELD (*McMinnville, Oreg.: Junior High School Press, 1915, April, pp. 6*).—This is an outline of a course in household accounting which has been introduced experimentally this year into the Junior High School at McMinnville, Oreg. It is elective for ninth grade girls (who have no thought of teaching) in the place of algebra, and deals with household arithmetic, budgets, social transactions, living costs, and methods of keeping household account books.

School room work for club members and others, W. H. BARTON (*Clemson Agr. Col. S. C., Farmers' Reading Course Bul. 11 (1915), pp. 15*).—This bulletin for rural school teachers contains a list of bulletins and suggestions for classroom and club work in agriculture and for practical field work consisting of two 3-year rotations of cotton, corn, and grain, and calls attention to a concrete example of a traveling agricultural teacher.

Household exhibits at fairs, INGA M. K. ALLISON (*Colo. Agr. Col. Ext. Ser., No. 105 (1915), pp. 15, figs. 2*).—Suggestions are offered on the classification, preparation, and entering of exhibits, which are grouped into three divisions, viz, food products, needle work, and home-made conveniences and devices. Score cards are included.

Reorganization of farmers' institutes (*Agr. Gaz. Canada, 2 (1915), No. 6, pp. 575, 576*).—An outline of a scheme adopted by the department of agriculture of Ontario for the thorough reorganization of farmers' institutes, enlarging their scope and expected to give more weight and practical effect to their proceedings.

List of workers in subjects pertaining to agriculture and home economics in the U. S. Department of Agriculture and in the state agricultural colleges and experiment stations (*U. S. Dept. Agr., List of Workers in U. S. Agr., 1915, pp. 122*).—This is the usual organization list of workers along these lines,

corrected to August 15, 1915, and includes in the case of this Department brief statements as to the organization and scope of its various branches.

MISCELLANEOUS.

Thirty-eighth Annual Report of Connecticut State Station, 1914 (*Connecticut State Sta. Rpt. 1914, pt. 6, pp. XIV*).—This contains the organization list, a report of the board of control, a financial statement for the fiscal year ended September 30, 1914, and a list of corrections to the report.

Twenty-seventh Annual Report of Maryland Station, 1914 (*Maryland Sta. Rpt. 1914, pp. XVI+246, figs. 63*).—This contains the organization list; a report by the director on the organization, work, and publications of the station; a financial statement for the fiscal year ended June 30, 1914; and reprints of Bulletins 178–184, previously noted.

Biennial Report of North Carolina Station, 1913–14 (*North Carolina Sta. Bien. Rpt. 1913–14, pp. 52, figs. 22*).—This contains the organization list, a report of the director and heads of departments, the experimental work of which is for the most part abstracted elsewhere in this issue, a financial statement for the fiscal years ended June 30, 1913, and June 30, 1914, two special articles noted elsewhere in this issue, and reprints of Bulletins 224–227, previously noted.

Monthly bulletin of the Western Washington Substation (*Washington Sta., West. Wash. Sta. Mo. Bul., 3 (1915), No. 6, pp. 11, figs. 2*).—This number contains brief articles on the following subjects: Farming as a Business, by H. L. Blanchard; Culture of Horseradish, by J. L. Stahl; Early Hatched Pullets and Winter Eggs, by V. R. McBride; Introducing Queens, by J. W. Ware; Apple Anthracnose or Black Spot, by H. L. Rees; and Fall Sown Hay and Pasture Mixtures, by E. B. Stookey.

Guide to buildings and grounds (*New York State Sta. Circ. 42 (1915), pp. 6*).—A brief description of the station buildings and grounds and of the experiments in progress.

A note book of agricultural facts and figures, compiled by R. C. Wood (*Coimbatore, India: Agr. Col., 1915, pp. 178, pl. 1, figs. 22*).—A handbook of information on machinery and buildings, labor, soils, manures, crops, feeds and feeding, live stock, dairying, insect pests, horticulture, forestry, weights and measures, mensuration, surveying, and statistics, with special reference to Indian requirements.

NOTES.

Connecticut College.—F. W. Duffee (Ohio State University, 1915) has been appointed instructor in agronomy and Glenn H. Campbell, assistant in dairy husbandry.

Illinois University and Station.—Dr. W. L. Burlison has been appointed associate professor of crop production in the college of agriculture and associate chief in crop production in the station. James H. Greene has been appointed state leader in junior extension, boys' and girls' work, in cooperation with this Department.

Iowa College and Station.—Recent appointments include Ross L. Bancroft as assistant professor in agronomy; H. W. Johnson as instructor in agronomy and assistant in soil bacteriology; F. S. Wilkins and Roy Westley as instructors in farm crops; and Earl Girton, associate professor of animal husbandry at the Alabama College and Station, as extension professor in animal husbandry.

Kentucky University and Station.—A barn for the study of live-stock diseases, a sheep barn, and a tile silo have recently been completed. Studies to improve the type of the general utility sheep in Kentucky and to determine the value of pure-bred sires as compared with scrub sires for the production of spring lambs are to be begun.

E. H. Nollau, assistant chemist in the station, has been appointed specialist in agricultural, physiological, and biological chemistry in the States Relations Service of this Department, succeeding on the *Experiment Station Record* Dr. L. W. Fetzer, who has become professor of physiology and biochemistry in the School of Medicine of Fordham University. George H. Vansell of the Kansas Station and C. F. Stiles have been appointed assistants in the departments of entomology and zoology in the college of agriculture.

Maine University.—J. F. Thomas has been appointed instructor in animal industry.

Massachusetts College.—Stockbridge Hall, the new agricultural building, was dedicated October 29. The program included addresses on Levi Stockbridge and Charles L. Flint, by W. H. Bowker, of the board of trustees; Agricultural Possibilities in New England, by Dean J. L. Hills, of the Vermont University and Station; The Engineer in Agriculture, by W. Wheeler, secretary of the State Board of Agriculture; and a closing address by President Butterfield.

John C. McNutt, professor of animal husbandry and dairying at the North Carolina College, has been appointed professor of animal husbandry, vice John A. McLean, whose resignation has been previously noted.

W. F. Turner of this Department, who has been stationed at the Bureau of Animal Industry farm at Beltsville, Md., has been appointed extension instructor in animal husbandry, vice George F. Story, whose resignation has been previously noted.

Michigan College.—Kenneth G. Hancher (Ohio State University, 1915) has been appointed instructor in chemistry.

Missouri University and Station.—The present enrollment in the four-year course in agriculture as candidates for the degree of Bachelor of Science in agri-

culture or forestry is 570. There are also 40 students enrolled in the graduate school, as candidates for the degree of Master of Arts or Doctor of Philosophy, who are taking their major work in some branch of agriculture, and 196 students in the two-year winter course in agriculture of whom 17 are women enrolled in the short course in home economics.

A refrigeration plant is to be installed in the agricultural chemistry building.

M. E. Hays, a 1915 graduate of the university, has been appointed assistant in horticulture; Miss Clella Jenkins, assistant in home economics; Harold C. Libby, assistant in veterinary science; K. C. Sullivan, deputy inspector of nurseries; and William H. Baker, assistant extension professor of soils and farm crops. Miss May C. McDonald has resigned as assistant professor of home economics and has been succeeded by Miss Babb Bell, and Carl C. Filler has resigned as field demonstrator in the hog cholera serum work. C. S. Woodard has been appointed farm demonstrator for negro farmers from March 1 to September 1 of each year, his remaining time being spent at the Bartlett Negro School at Dalton. C. M. Long has been transferred as county agent from Johnson County to Pettis County, succeeding S. M. Jordan, resigned, and has been succeeded by F. A. Gougler; and W. R. Hendricks has been appointed county agent for St. Charles County.

Montana College and Station.—Dr. Edward C. Elliott, of the department of education of the University of Wisconsin, has been appointed chancellor of the University of Montana, comprising the State University at Missoula, the State College at Bozeman, the School of Mines at Butte, and the State Normal School at Dillon, beginning February 1. J. D. Morgan, assistant in the State grain laboratory, has resigned to take up work in grain standardization for the Bureau of Plant Industry of this Department, with headquarters at New Orleans, and was succeeded by E. W. Jahnke, November 15, 1915.

New Hampshire College.—C. J. Fawcett (Ohio State University, 1915) has been appointed instructor in animal husbandry.

New Jersey College and Stations.—Warren W. Oley has resigned as extension specialist in fruit growing to become farm demonstrator in Cumberland County. Other appointments include William J. Carson as professor of dairy husbandry and dairy husbandman; Allen G. Waller as assistant in crops; Franklin O. Church as research assistant in hydraulic engineering; Fidel P. Schlatter, as research assistant in cranberry investigations; and Lawrence G. Gillam, as instructor in horticulture in the short courses.

New York State Station.—According to a note in *Science*, A. W. Bosworth, associate chemist, has accepted an appointment as chief of the department of biological chemistry of the Boston Floating Hospital, beginning about January 1.

Oklahoma College.—Dr. Charles O. Chambers, of Peabody College, has been appointed professor of botany.

Oregon College.—F. L. Griffin, head of the girls' and boys' industrial clubs, has resigned to accept a similar position at Cornell University, beginning February 1.

South Dakota College and Station.—V. R. Jones, assistant in dairy industry in the college of agriculture of Cornell University, has been appointed assistant professor of dairy husbandry and assistant dairyman.

Vermont University.—A hog barn, 30 by 88 feet, with a concrete floor, has been erected which accommodates from 55 to 65 mature hogs. H. A. D. Leggett has been appointed instructor in poultry husbandry in the college of agriculture and John A. Dana farm agent for Chittenden County.

Washington College.—Ernest O. Holland, superintendent of schools in Louisville, Ky., has been appointed president to succeed Dr. E. A. Bryan, beginning

January 1. Leonard Hegnauer has been appointed soils and crops specialist for field work in the extension department.

West Virginia University and Station.—Arthur C. Ragsdale has been appointed instructor in dairy husbandry, vice G. W. Thompson, resigned. J. H. B. Krak has been transferred from the department of soils to become assistant chemist, dividing his time equally between the State geological survey and the station, and has been succeeded in the department of soils by Robert M. Salter. J. P. Bonardi (New Hampshire College, 1915) has been appointed assistant chemist in fertilizer work.

Wisconsin University and Station.—An addition to the hog cholera serum plant by which the manufacture of the serum and virus may be carried on in separate buildings is under construction. A cement silo has been erected for use in feeding experiments and the beef cattle barn has been remodeled. Buildings are also being put up at the substations at Ashland Junction, Marshfield, and Spooner under a state appropriation of $3,500.

The proportion of city-bred students in the college of agriculture has fallen from 22 per cent in 1914 to 16 per cent.

F. A. Aust, assistant in landscape design in the University of Illinois, has been appointed to take charge of the courses in landscape design and the supervision of the campus. W. J. Geib has been appointed assistant professor of soils. C. D. Livingston and J. W. Braun have been appointed instructors in the college of agriculture and assistants in the station, the former in agricultural engineering, and the latter in horticulture and plant pathology.

Agricultural Instruction in Canada.—W. R. Reek has resigned as associate professor of animal husbandry at the Ontario Agricultural College to take charge of the extension work in agriculture of Prince Edward Island. T. J. Harrison, superintendent of the substation at Indian Head, Saskatchewan, has been appointed professor of field husbandry at the Manitoba Agricultural College, and has been succeeded by W. H. Gibson, assistant superintendent at the substation at Lacombe, Alberta. J. B. Reynolds has been appointed president of the Manitoba College. S. B. McCready resigned July 1, 1915, as director of elementary agricultural instruction in the department of education of Ontario, and has been succeeded by Dr. J. B. Dandeno, formerly associate professor of botany at the Michigan College, who will have the title of inspector of elementary agricultural classes in the normal and high schools. F. S. Grisdale has been appointed principal of the school of agricIture at Vermilion, Alberta.

Valentine Winkler has succeeded George Lawrence as minister of agriculture and immigration of the Province of Manitoba. A farmers' cooperative poultry fattening station is being operated at the college. Poultry is shipped in by the farmers, fattened for from 14 to 18 days, killed, dressed, and sold, returns being made after deducting express charges and the actual cost of fattening and handling. G. C. White has been appointed professor of rural economics and farm management and J. A. Neilson lecturer in horticulture.

The Alberta government, by an order in council of April 29, 1915, established a college of agriculture in connection with the University of Alberta. E. A. Howes, principal of the school of agriculture at Vermilion, has been appointed dean of the faculty of agriculture, and George A. Harcourt, deputy minister of agriculture, assistant to the dean. H. A. Craig, superintendent of demonstration farms, was appointed deputy minister of agriculture, and Sydney Carlyle, superintendent of demonstration farms. Only advanced work, beginning with the third year, will be offered in the agricultural department of the university, and applicants for admission must have taken the two-year course in one of the schools of agriculture. There were 67 graduates of these schools in readiness

for the beginning of the college course, 89 students having been graduated March 26 from the two-year courses of the provincial schools of agriculture at Claresholm, Olds, and Vermilion. These were the first graduates of the complete course from these schools.

A movement for the organization of young women's institutes was begun in Quebec in January, 1915, with the establishment of three women's clubs, known as young farm women's clubs (*cercles des jeunes fermières*). They differ from women's institutes in dealing mainly with agricultural matters, while the object of the latter is to teach domestic science.

The department of education of British Columbia has decided to include agriculture as an optional subject in the high schools. Instructors especially qualified to give instruction in agriculture will be appointed in the schools, will also assist in teaching some of the regular science subjects of the high school, especially biology, and will also spend a part of each week supervising the work in elementary agriculture and school gardening in the public schools of the locality. Extension classes in agriculture will be opened for boys and young women who are not regular students in the high schools.

An agricultural instruction committee has been appointed in Saskatchewan to advise on all matters pertaining to the scope and character of agricultural education in the public, high, and normal schools. The committee consists of the superintendent of education, the dean, director of extension work, and professor of agricultural engineering of the Saskatchewan College of Agriculture, the principals of the normal schools at Saskatoon and Regina, and the deputy ministers of agriculture and education. Two directors of agricultural instruction in the schools have been appointed, F. W. Bates for the northern half of the Province, and A. W. Cocks for the southern half. They will be closely associated with the normal schools, will follow up the work of the teachers in their respective districts both in the public and high schools, and will be ex-officio members of the agricultural instruction committee.

The first short course for clergymen to be held in Canada was offered at the Manitoba College this summer, with an attendance of 107.

School of Farm Mechanics in Argentina.—On September 5, 1915, a school for farm mechanics instruction was inaugurated at Rafaela in the Province of Santa Fe for students at least 16 years of age, who can speak, write, and read Spanish and understand mathematics up to and including elementary geometry. The school, which has been recognized by the provincial government, will issue diplomas and offer a 2-year course in farm mechanics, including theoretical and practical instruction in general farming, agricultural machinery and implements, forge and carpentry work, boilers and motors, wells, electricity, designing, agricultural hydraulics, applied mechanics, mathematics, etc.

Necrology.—Joseph E. Wing, widely known as an agricultural writer and lecturer, died September 10, 1915, at Mechanicsburg, Ohio, aged 54 years. He was the author of a number of well-known books, including Sheep Farming in America, Alfalfa in America, Meadows and Pastures, and In Foreign Fields. In recent years he had given special prominence to the advocacy of alfalfa growing, the use of lime and cement, and improved farm living conditions. He was also a member of the governing board of the Ohio State University.

The death is noted of Dr. Thomas Kosutâny at Budapest at the age of 67 years. He had been director of the Hungarian Agricultural Institute for Chemistry since 1903, and received the iron cross of the third class in 1907. He was the author of a considerable number of scientific articles, studying among other subjects the influence of pure cultures in winemaking, the chemistry and physiological character of Hungarian tobacco, and Hungarian wheats and their value for flour and breadmaking.

James McCall, principal of the Glasgow Veterinary College, and one of the pioneers in applying veterinary science to public health through the inspection of meats and dairies, died November 1, 1915, aged 81 years.

Frederick Mawson Bailey, colonial botanist to the Queensland Government since 1881, died June 25, 1915, aged 88 years. In addition to various papers on economic subjects, his greatest work was the Flora of Queensland.

Edouard Prillieux, member of the Academy of Sciences of Paris, and well-known through his contributions to plant pathology, died October 8, 1915, aged 86 years.

M. F. P. V. Guéguen, professor of botany in the School of Agriculture at Grignon, has died at the age of 43 years.

Ernest Lee, lecturer in agricultural botany at the University of Leeds, has been killed in the European War.

Miscellaneous.—The president of the Board of Agriculture and Fisheries of Great Britain has appointed a departmental committee for the purpose of considering the steps necessary by legislation and otherwise to maintain, and if possible, increase the present production of food in England and Wales. Viscount Milner has been made chairman and H. L. French, of the Board, secretary of the committee, and among the other members is A. D. Hall. This committee is entirely separate from the permanent agricultural consultative committee appointed at the beginning of the European War, to which miscellaneous subjects connected with practical agriculture are being referred.

An agricultural station has been established at Bie on the Benguella Plateau in Angola. Experiments in cotton growing are also being made.

According to *Deutsche Landwirtschaftliche Presse*, Dr. Warmbold of Berlin has been appointed director of the agricultural high school of Hohenheim. Dr. Gustav Frölich of the University of Göttingen has succeeded Dr. von Nathusius, deceased, as professor of animal husbandry and dairying in the Agricultural Institute of the University of Halle.

Dr. Franz Honcamp, director of the agricultural experiment station at Rostock, Germany, has received the iron cross of the second class.

G. Massee has retired as head of the cryptogamic department at the herbarium at the Royal Botanical Gardens at Kew.

A statue has been dedicated at the agricultural school at Saragossa, Spain, in honor of Rodriguez Ayuso, a former director.

The Philippine Commission has allotted $17,500 for agricultural and industrial advancement, sanitation, education, and irrigation.

Dr. Frank K. Cameron resigned from the Bureau of Soils of the U. S. Department of Agriculture November 1, 1915, to engage in commercial work.

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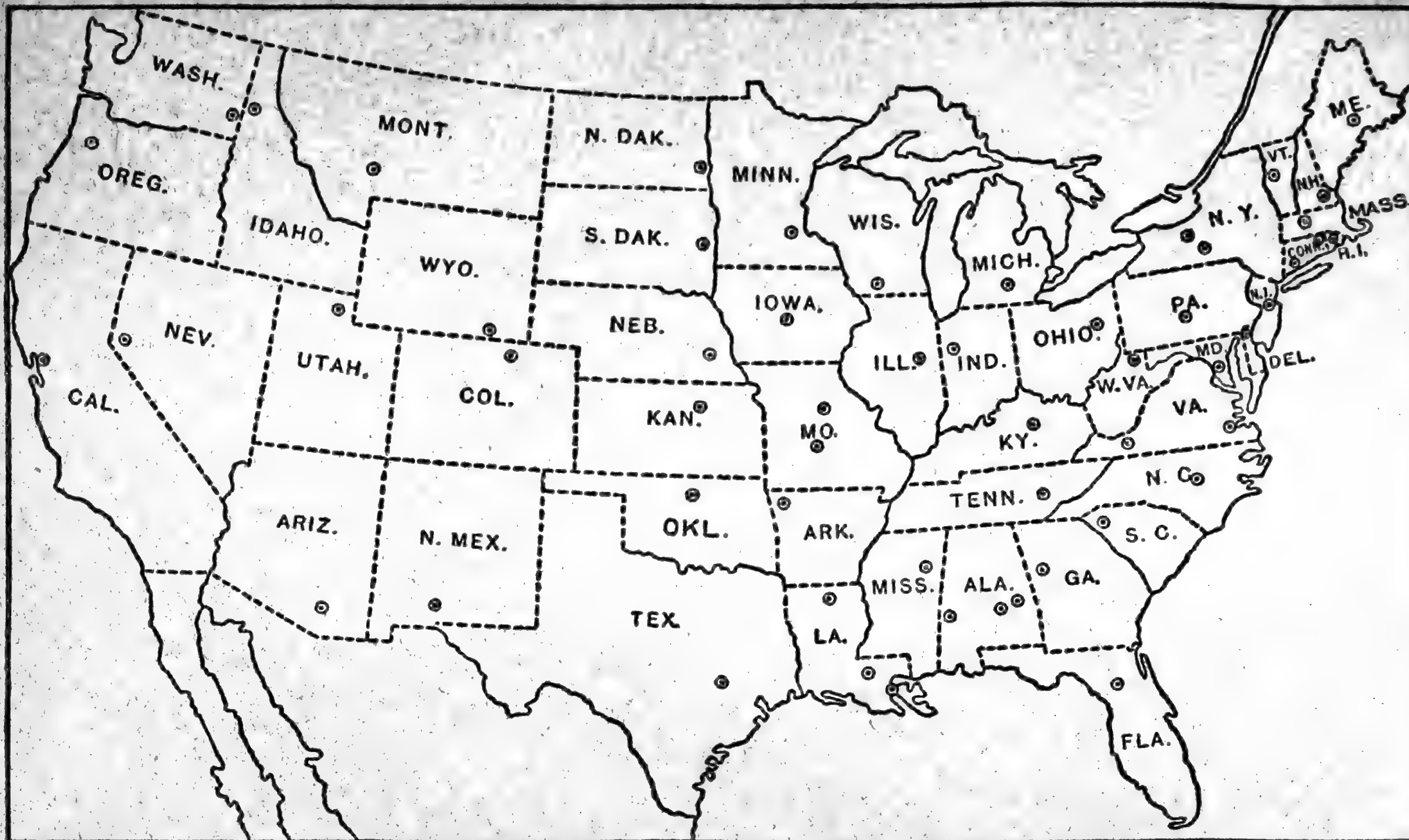

THE AGRICULTURAL EXPERIMENT STATIONS OF THE UNITED STATES.

U. S. DEPARTMENT OF AGRICULTURE
STATES RELATIONS SERVICE
A. C. TRUE, DIRECTOR

Vol. XXXIV FEBRUARY, 1916 No. 2

EXPERIMENT STATION RECORD

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1916

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U. S. Department of Agriculture—Contd.

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EXPERIMENT STATION RECORD.

VOL. XXXIV. FEBRUARY, 1916. No. 2.

Extension teaching and demonstration will deal with both the product of experience and scientific theory—with the results of good practice as worked out by leading farmers, and the results of the investigations and experiments made by the stations. The extension worker, therefore, will have these two general sources of information at command, which will often need to be fitted together or reconciled.

Both classes of information require care in interpretation as applied to particular sets of conditions or questions. Especially is it important that local experience should not be too implicitly relied upon or accepted as final. It is useful to the extent that it is rightly interpreted, but it is very subject to misinterpretation, and it is often taken to furnish the whole answer. It is "many times unsuspecting, blind, and prejudiced," and at best it is an insufficient and often unreliable means of advancing learning or understanding.

We may think of science as the relation of cause and effect. It is the cause-and-effect relationship which gives us something dependable upon which to build. Whenever we observe an effect there has been a cause; and we now know that in agriculture, as much as in astronomy, the same cause acting under precisely the same conditions will produce precisely the same effect. When we do not understand why certain events occur, the reason is that we do not understand the forces which operated to produce the events. This is where practical experience breaks down. It can not explain relations between what it sees and the probable cause, because it can not measure conditions it does not understand or the effect or forces it knows not of. For this reason it has never discovered a law or explained a phenomenon. Its doctrines are purely empirical and its methods rule of thumb instead of resting on reason and understanding. It may serve to bring the level of agricultural practice nearer that of the leading farmers of each community, but it does not go outside of or beyond itself. Its eye is upon the past rather than upon the future, and its criteria of excellence are found in the records of tradition, often shown to be in error when a finer test is

applied. This is not to decry its value, rightly applied, but to explain its limitations and its inadequacy in the present movement.

Man has had more extended and varied experience in agriculture than in any other vocation or branch of industry. If alone it were a competent basis for progress farming should be the most enlightened and advanced of all the arts. But a comparison of the writings of Virgil's time with those of the Middle Ages and even of the fifteenth and sixteenth centuries shows how slow and inadequate it was. After many many centuries of experience and theorizing man had no idea of the simplest fundamental facts, as to how plants grow and feed, or what their real relations are to the soil and the air. As recently as a hundred years ago the source of the predominating constituent of plants, carbon, which forms the whole structure and largely the reserve material of the plants, was unknown. It had been thought to come from the humus of the soil, and de Saussure's theory (in 1804) that it came from the carbonic acid of the air was not accepted. The experimental method brought a new means of approach, a new method of acquiring knowledge by going outside of human experience, and by putting to the test facts and theories of both practical and scientific importance. It gave a constructive and dependable basis for advancement.

Now as then, practical experience unaided will prove inadequate in advancing the art and the theory of agriculture and in teaching it through extension methods. Now, as in former times, intelligent advancement and teaching must rest on a more solid basis of established fact, and must take account of the reason or explanation of conclusions and theories. This has been the great contribution of the experiment stations—to propagate an attitude demanding proof and understanding of all prescribed knowledge, as well as in providing a method and a body of information.

The utilization of the work of the experiment stations in promoting agricultural advancement and improving farm practice has from the very first loomed large on the horizon of the station workers. It has given direction to the stations' activities and few workers have failed to catch the spirit of the broad intent. Practical utility, or the hope of directly beneficial results, has not only quite largely shaped the character of the work but under the zeal of its stimulus station investigators have made every attempt to translate as early as possible the results of their laboratory findings into methods of practice, and by every available means to bring them to the attention of practical men.

The energy and effort put into this dissemination and introduction of the station findings, and the agricultural renaissance which has come as a result of it, are not forgotten at this time when a large

special service has been provided to propagate and translate into practice the accumulated results and the latest conclusions. This agency will furnish an even more intimate and vital link between the stations and the farming public than the stations could themselves maintain. And sooner or later in every State, no matter how backward and primitive the agriculture may now be, the success of the teaching and aid of the extension service will rest back upon the work of the experiment stations.

When the extension legislation was being considered large and confident predictions were frequently made as to what would result in American agriculture if the findings of the experiment stations and of this Department were put into practice the country over, and estimates in this line continue to be made. They are interesting, and are startling to a degree which has aroused widespread confidence in the possibility of improvement and in the basis at hand for effecting such an improvement. It has even been suggested that we could afford to pause in our labors in acquiring exact information and devote a while to disseminating it and helping the public to catch up.

This zeal for the teaching of better agriculture should not be allowed to minimize the necessity for the continued work of the stations. It is no time for the public or the station worker to be lulled into inaction by the lead the stations have attained over practice. Once the new movement for extension teaching is in full swing the public, at least a part of it, will overtake us more rapidly than we realize. Future progress in investigation will necessarily be slow; it can not be hurried. Soon some of the weak or deficient spots in the present body of information will be disclosed, and the soundness and permanence of some of the scientific doctrine may be called into question. The extension work will put the conclusions of practical tests, of extended experiment, and of searching inquiry to the most rigid test under a great variety of practical conditions. It would be surprising if some of these were not modified or at least found economically inapplicable; and where the theory rests alone on tradition or uncontrolled experience, rather than on the basis of science, its inadequacies will sooner or later be brought to light.

The fear is not that the station work as a whole may prove inadequate to the test, as far as could reasonably be expected, but rather that through misunderstanding and overconfidence in its sufficiency, its future may be allowed to suffer. The progressive, thorough, and fundamental studies of the stations are needed quite as much as ever before—in some ways more so. The pressure upon the stations will be no less, although it may be of a more patient and understanding nature; and their responsibilities will be increased because of the greater dependence upon them.

It may be profitable at this time to examine the nature and extent of the station work in relation to the basis it furnishes for extension teaching and for a more rational agriculture. This may develop the wide range to which the results are applicable at the present stage, and likewise disclose weak points and phases which should receive sound and more exhaustive study. Manifestly, a comprehensive or detailed review is not possible here, but the bare enumeration of some of the salient lines may suggest the broad and substantial nature of this basis, and also indicate the ways in which the course of investigation has changed as a result of the clearer insight which its progress has furnished.

Such a review and critical self-examination would be profitable for every station. It would help to emphasize and demonstrate the future need for funds and opportunity.

It was necessary at the outset for the experiment stations to establish the data of agricultural science through their own studies and the accumulation of the sciences. The materials with which they work had to be studied in order that they might be more accurately defined. The tools of science and the methods of investigation required considerable adaptation and refinement. We find, therefore, throughout the station literature a very large amount of analytical work, done to get at the composition of a great variety of materials, old and new, which are products of or employed in agriculture. A broad background of such data is now available, which has been summarized or made readily accessible so that new analyses are only needed for special purposes and not to meet the usual inquiries of the public.

The knowledge of the composition and digestibility of feeding stuffs was further increased by careful studies of these materials in the bomb calorimeter, to determine their fuel or energy value, and with man and animal subjects in the respiration calorimeter to determine their physiological value. The tendency in these investigations, as throughout the whole field of agricultural research, has been to reduce the problem to simpler terms, to eliminate the incidental factors, so that the whole matter may be stated so far as possible in terms of chemistry and physics. This clearing away of the unessentials and focusing of the attention upon the fundamental features of each problem has prepared the way to the control of natural forces through an understanding of their values and interactions.

Similarly, the experiment station work in the field of botany began with the collection of plants, their classification, the publication of floras, the making of surveys for special purposes, studies of ecology, and attention to special groups, such as honey, medicinal, and poisonous plants. Later more attention was given to the study

of the physical and chemical forces operating in the plant. This involved the determination of the factors of growth, dormancy, transpiration, sap movement, tolerance of alkali and other compounds, etc. Breeding experiments, and especially those relating to the principles of breeding, have been a more recent development and have resulted in encouraging progress. In these breeding studies, however, as in all other lines of agricultural investigation, every step in advance has shown the urgent need of greater precision of method and of attacking the problem from the fundamental standpoint.

Accordingly, the viewpoint of the investigator has constantly shifted as he reached a new advanced point and looked at the field from a fresh angle, and the doctrine to which he could conscientiously subscribe has naturally undergone a constant revision. The outcome of the plant-breeding investigations has been to furnish a much clearer conception of the nature of plant evolution, heredity, and improvement, and the limitations possible in turning these to advantage. In other words, it has been placed upon a more practical basis, and the exaggerated expectations for a time aroused have been corrected and brought to a more reasonable ground.

In the field of soil investigation the stations have made large contributions. This work at first related principally to the chemical and physical properties of soils, but soon involved a study of soil bacteria, ammonification, nitrification, denitrification, protozoa, effect of heat, acidity, and alkalinity in relation to soil organisms and to the plant. The moisture movement and the water relations of soil, drainage, percolation, capillarity, flocculation, hygroscopic moisture, the wilting point and water requirement of plants, and related matters have formed a large chapter in soil investigation. And the findings in these fields have been applied to the treatment and handling of soils in such matters as liming, cultivation, mulching, plowing, subsoiling, fallowing, etc.

In soil investigation, as in many other lines of work, the tendency at first was to attempt to progress too rapidly. It was assumed at the outset by many that on the basis of a chemical analysis of the soil a prescription could be written for the farmer, directing him what to do in order to increase his crop yields. It was soon found, however, that the question was a much more complicated one, and the development of the present understanding of the soil, imperfect as it is, is one of the large products of agricultural investigation. Recent work in soils has involved far more fundamental and more narrowly restricted investigations of specific problems, classified in the three general fields of chemistry, physics, and biology of soils. Here, as elsewhere, it has been found necessary to understand the nature of the problem before it could be successfully attacked. And

the foundation which accumulated investigation has laid for this better understanding of the nature of the questions studied is one of the important products which the public rarely appreciates. It has modified the method of attack and the kind of information sought.

We no longer study soil fertility; we study some special phase of the problem, and the exact manner in which it affects the composite condition designated as fertility. Neither do we study summer fallowing for itself, but we seek out and study the factors which are vitally involved in it. To determine merely that so many more bushels of wheat were produced where the field was summer fallowed is a demonstration at the present stage, and not an experiment designed for getting new information. Studies in nitrification and ammonification were carried on assiduously for several years before the accuracy of the methods of study began to be questioned or the care realized which should be exercised in drawing deductions from the results. Investigators have come to feel that the meaning and correlation of nitrification with other processes must be fundamentally examined before a deeper understanding of its relation to methods of practice can be reached.

The study of fertilizers and their use has followed much the same course as that of soils. At first it was confined largely to analysis of the materials and tests to show their effects upon various crops in the field. The results obtained from these field tests were often so extremely variable, however, as to make them difficult to understand and to necessitate more exact methods and the determination of limiting conditions. From these the work led naturally to studies of the principles of the use of fertilizers, the relations of fertilizing materials in the soil, their availability to plants, and the fertilizer requirements of various crops.

Fertilizer investigations have, therefore, in recent years taken a quite different direction from the earlier work and are largely concerned with narrowly restricted, specific studies. The result has been to inject more caution into extension teaching regarding the use of fertilizers, and to regard new results with some measure of doubt until they are sufficiently confirmed. The broad basis for the intelligent use of fertilizers has been laid in the work of the past twenty-five years, and the present question is one of economic and wise use as applied to a given farming system or region.

The early work of the stations on field crops included an immense number of practical experiments on crops of all kinds, together with special investigations relating to them. The feeding value, cultural methods, fertilizer requirements, improvement by breeding, adaptation, and the merits of varieties were studied with every farm crop grown commercially in the country. This furnished a broad basis

of practical information, and the foundation for such special investigations as the chemical changes which occur in the ripening and the storage of crops, in the fermentation of tobacco, in the kiln drying of hops, etc. Thousands of rotation experiments were carried on in an attempt to get practical guidance for rotation systems in different localities. Recently, these rotation experiments have become more specialized because the composite effect of the rotation is more clearly recognized. An attempt is being made to determine the specific effects of one crop upon the following crop in the rotation, upon the biological life of the soil, and upon the factors which go to determine the fertility of the land as effected by rotations.

The improvement of field crops by breeding and selection and by the use of better seed has been one of the large lines of work. The difficulties in effecting permanent improvement have been found greater than was earlier anticipated, and the result of the investigation in breeding farm crops has been to make workers more cautious regarding the claims of what may be done in that line. The present tendency is to attempt an analysis of the characters to determine which are heritable and which can be imposed upon or combined with other characters.

In horticulture the early work of the stations was similar to that with field crops, being confined to tests of fertilizers, varieties, cultural methods, the methods of propagation, etc., of fruits and vegetables. The management of orchards, storage of the fruit, canning and evaporation of fruits and vegetables, marketing, and similar problems also received much attention. The work has covered all of the fruits, garden crops, and nuts grown commercially in the United States, and a large percentage of the familiar ornamentals.

In the early days of the stations the urgent demand was for simple experiments to give quick, definite results of interest to practical horticulture. After this demand had been met in considerable measure, the research projects, as in other fields of agriculture, became more specific, and centered about the underlying factors of plant growth and physiology. Now there are a large number of fundamental projects aiming at a better knowledge of the common methods and processes of horticultural plants, the principles of breeding as exemplified in them, and the chemistry, physics, and physiology involved in these processes.

In animal feeding the range of practical experiments on which the extension worker may draw is unusually wide and rich. It includes all the common farm-grown feeding stuffs and all the principal by-products and manufactured feeds which the market affords. The value of these for all kinds of farm stock, for growth, for milk production, and for work, has been tested, and their economic value has

been the subject of extensive experiments. In addition to these more directly practical experiments, the functions of food in the animal body, its physiological requirements, and the comparative effects of nutrients from different sources have received much study. These mark the latest advancement in feeding investigation.

In the physiology of nutrition, two lines of work are showing special activity at the present time—the study of mineral nutrition and of the relative efficiency and adequacy of proteins from different sources. This illustrates again the tendency of all agricultural research toward greater precision and definiteness.

For many years the problems of animal nutrition were studied without much regard to the function or the requirements of minerals in feeding stuffs, but later investigation has shown the question of mineral balance in animal rations to be one of great importance. The only difference formerly recognized in the constituents of different feeding stuffs, including the protein, was a difference in digestibility. But when the proteins from different sources came to be isolated and studied their constitution was found to differ materially and also their effect in the nutrition of the animal. This has shaken the old confidence in the mere analysis of feeds as indicating their value in animal feeding. The proof has already been furnished that the constitution of the protein molecule is of fundamental importance in determining its nutritive efficiency, some of these compounds being quite defective for maintaining life, while others are highly efficient. The scientific basis of these differences is gradually being established, and in the meantime caution is exercised in the calculation of rations on the mathematical basis.

It is only necessary to refer to the great amount of study of injurious insects and pests, the large number of plant diseases and other affections, and the successful devising of means for their control or eradication to show what a storehouse of directly available information of the most practical sort is now at hand. The difference between intelligent control of these pests and their unrestrained action means many millions of dollars in crops alone. The case is similar with animal diseases, where we are told that the country suffers a loss of $212,000,000 annually in live stock from diseases which are now understood and preventable.

In dairying the work of the stations has largely revolutionized the industry, and furnishes a basis which needs only to be applied to work even greater benefits.

In some respects the development of knowledge has made the station worker less sure of theories than before, and more prone to caution in presenting them as a basis for practical action. It will be for the experiment station to exert its influence in combating over-

confidence in these respects and the too positive repetition of theories once thought true, as well as to add to the supply of new facts and theories. It must be remembered also that much of the later and more technical investigation is not yet ready for extension, because it is not sufficiently advanced and can not be safely generalized from and put into teaching or practical form.

It will be seen that in all departments of work the station men attacked first the problems which lay nearest to hand. In all cases the method of attack improved and became more definite as the nature of the problems became better understood. The point of view has therefore shifted, and old theories have been replaced by newer and more dependable ones. There must be intelligence, therefore, in the interpretation and use of even the experiment station results, having regard to the status of inquiry and the time of publication.

The publications of the experiment stations furnish a printed record of their scientific and practical achievements. Since their inception the stations have issued approximately 14,200 bulletins and annual reports. These have dealt with practically every phase of agricultural work and every condition represented by this varied country. Together with those of this Department, they comprise an immense fund of agricultural knowledge. They furnish the best, in fact the only, basis for the rational improvement of farm practice through extension work. Much of the doctrine laid down in station bulletins will stand the test of time and searching criticism. Some of the conclusions will doubtless have to be revised or perhaps rejected in the light of new knowledge.

Certain parts of this great open volume of agricultural doctrine are empirical. In agricultural science just as in medical science many treatments are confidently recommended on the basis of careful experiment, although no one has yet learned why the treatments are beneficial. Quinin was known to be a specific for malaria before any explanation of its action was obtained. So also certain crop rotations and summer fallowing can be safely recommended, although station workers are still wrestling with the problem of the nature and the explanation of the benefits derived from these practices. But the gaps in agricultural science are gradually being closed. As the nature of the problems becomes better understood, the method of attack is better organized. With clearer statement of the problem a clearer answer is obtained.

In improving farm practice the extension worker must look to the investigator for reliable facts and data and doctrine. Sound teaching must be based on findings developed or tested through the methods of science. The accepted facts and traditions of experience

have proved unsatisfying, inadequate, and often untrustworthy as guides to progress. The data of science are obviously more reliable than the data of experience, but they too must be constantly reexamined in the light of new knowledge and must be correlated with one another to provide the foundation for further advance.

Agricultural science is manifesting an organic growth by the orderly and symmetrical assimilation of tested knowledge. Extension teaching will remain vital and responsive to the ever varying needs of practical farming so long as the extension workers are in living touch with the station investigations.

RECENT WORK IN AGRICULTURAL SCIENCE.

AGRICULTURAL CHEMISTRY—AGROTECHNY.

The germ plasm as a stereochemic system, E. T. Reichert (*Science, n. ser., 40 (1914), No. 1036, pp. 649–661*).—Substantially noted from another source (E. S. R., 32, p. 501).

On the colloidal swelling of wheat gluten, F. W. Upson and J. W. Calvin (*Jour. Amer. Chem. Soc., 37 (1915), No. 5, pp. 1295–1304, figs. 5*).—"The experiments described in this paper show that the mixture of vegetable proteins which comprises wheat gluten behaves in a manner entirely analogous to the animal colloids as studied by Fischer and others. Moist gluten absorbs water from acid solutions and the amount of absorption varies with the kind and concentration of the acid. The presence of neutral salts retards water absorption by gluten, and in the higher concentrations of salt may even cause loss of water from moist gluten. Gluten which has taken up water in an acid solution loses water and regains its original physical properties when placed in a salt solution. The nonelectrolytes are much less effective than electrolytes in inhibiting the swelling of gluten in acid solutions. These experiments, therefore, contribute to the important problem of the mechanism of water absorption and secretion by living plants, which in animals has been proved by Fischer to be essentially a colloid phenomenon."

Studies on enzym action.—XIII, The lipase of soy beans, K. G. Falk (*Jour. Amer. Chem. Soc., 37 (1915), No. 3, pp. 649–653*).—In continuation of work previously noted (E. S. R., 32, p. 803), "the lipolytic properties of soy beans were studied by the methods used in the similar studies of castor beans and of duodenal contents. A comparison of some of the properties of these hydrolytic enzyms showed the following relations:

"Soy beans contain a lipase active toward triacetin (and therefore presumably toward fats), somewhat soluble in water, with a maximum solubility in 1.5 normal sodium chlorid solution. Castor beans contain an esterase soluble in water, and a lipase insoluble in water and soluble in sodium chlorid solution with a maximum solubility at the concentration 1.5 normal. Duodenal contents contain an esterase and a lipase, the former predominating in the intestinal juice, the latter in the pancreatic juice and bile. Marked similarities in the action of neutral salts and alcohols are shown by the lipases from different sources. The action of heat and of drying on the soy bean lipase was found to be similar to their action on castor bean lipase and esterase. The analyses of the soy bean lipase preparations showed no marked differences in comparison with the analyses of the castor bean preparations."

Further applications of the boric acid method for determining ammonia, L. W. Winkler (*Ztschr. Angew. Chem., 28 (1915), No. 10, Aufsatzteil, p. 48; abs. in Jour. Soc. Chem. Indus., 34 (1915), No. 6, p. 278*).—The author reports that the method previously noted (E. S. R., 33, p. 312) can be employed for de-

termining aliphatic amins as methylamin and trimethylamin, and for ascertaining the purity of lithium carbonate and basic magnesium carbonate.

The precipitation of phosphorus as ammonium phosphomolybdate in the presence of sulphuric acid, K. G. FALK and K. SUGIURA (*Jour. Amer. Chem. Soc., 37 (1915), No. 6, pp. 1507–1515*).—"The precipitate of ammonium phosphomolybdate formed in the presence of sulphuric acid (as in Neumann's method) contains sulphate apparently as an essential part of the molecule, together with an excess of molybdic oxid, and no nitric acid. The composition of this phosphosulphomolybdate precipitate may vary with the concentration of the different constituents in the solution. These variations explain the different factors found for the titration of the precipitate with alkali. The composition of the precipitate for a certain set of conditions was found to be $4\ [(NH_4)_3PO_4.12\ MoO_3]+(NH_4)_2SO_4.5MoO_3$."

A new test for copper, W. G. LYLE, L. J. CURTMAN, and J. T. W. MARSHALL (*Jour. Amer. Chem. Soc., 37 (1915), No. 6, pp. 1471–1481*).—An aqueous solution of normal amino-caproic acid is said to be an exceedingly sensitive reagent which is more specific than other reagents composed for detecting copper. As little as 0.004 mg. may be found by this means. Mercury and zinc interfere with the test, but the precipitates caused may be prevented, in the case of mercury, by the addition of sodium chlorid, and with zinc by adjusting the acidity of the solution.

The effect of grinding the soil on its reaction as determined by the Veitch method, P. E. BROWN and H. W. JOHNSON (*Jour. Indus. and Engin. Chem., 7 (1915), No. 9, pp. 776, 777*).—In experiments with unground sandy loam soils containing varying amounts of sand and the same soils ground so as to pass 20, 40, and 80 mesh sieves, it was found that when acid soils are ground before being tested by the Veitch method the acidity is reduced and the reaction frequently becomes basic. The development of basicity increased with the degree of grinding of the soil and the increase depended upon the amount of sand present, being greater in coarse sandy soils than in fine sandy soils. These results are taken to indicate that soils should be in their natural condition and unground when tested by the Veitch method.

The determination of nitrates in soil, R. S. POTTER and R. S. SNYDER (*Jour. Indus. and Engin. Chem., 7 (1915), No. 10, pp. 863, 864*).—Comparative tests of calcium oxid and calcium carbonate as flocculating agents in obtaining the soil extract to be used for the determination of nitrates led to the conclusion that with soils low in nitrates the use of calcium carbonate is to be preferred, and when the colorimetric method is used is always better.

Methods of determining iron and alumina in mineral phosphates, V. P. KOCHETKOV and D. N. KASATKIN (*Iz Rezul't. Veget. Opytov Lab. Rabot, 9 (1913), pp. 71–80*).—Comparisons of methods of quantitative analysis of Viatka and Smolensk phosphates and of artificial mixtures of the principal salts found in natural phosphates for sesquioxids of iron and alumina are reported.

The methods compared were (1) Glaser's method, (2) precipitation of iron and aluminum phosphates by sodium acetate after neutralization of the acid phosphate solution by sodium carbonate, (3) precipitation of the iron and aluminum phosphates by ammonium acetate, and (4) Grandeau's method of precipitation of the hydrates of the sesquioxids by ammonia after treatment of the acid phosphorite solution with acetic acid for the elimination of a large part of the calcium phosphate and by molybdate of ammonia for the elimination of the remainder of the phosphoric acid.

The method of Grandeau (4) was found to give the best results. Glaser's method (1) gave results slightly inferior which are considered suitable for in-

dustrial analysis. The second method gave good results when an excess of acetic acid was used, but the third method apparently does not merit use.

The adulteration of preserved beef with horse meat, G. Issoglio (*Ann. R. Accad. Agr. Torino, 57 (1914), pp. 204–213*).—Methods are given for the detection of horse meat in canned beef.

Bread, C. J. Koning and W. C. Mooij, Jr., (*Chem. Weekbl., 11 (1914), No. 50, pp. 1064–1066*).—A method is given for the detection of large quantities of unbolted flour in bread. Analyses show that unbolted meal and bread prepared from it contain a much greater pentosan content than do the bolted products.

Determination of the flour content of bread, G. J. Van Meurs (*Chem. Weekbl., 12 (1915), No. 2, pp. 20–24*).—A criticism of the above article.

The flour content problem, K. Scheringa (*Chem. Weekbl., 12 (1915), No. 6, p. 117*).—A controversial article concerning the formulas suggested by Van Meurs for estimating the flour content of bread.

The determination of fat in ice cream by the Babcock method, C. A. A. Utt (*Jour. Indus. and Engin. Chem., 7 (1915), No. 9, p. 773*).—A method is described, using a mixture of sulphuric and acetic acids, which gives good results in the determination of fat in ice cream. Checks were obtained in ice-cream mixtures made up according to various formulas within from 0.04 to 0.15 per cent of the amount occurring in the mixtures.

A new microscopic test for pasteurized milk, W. D. Frost (*Abs. in Science, n. ser., 42 (1915), No. 1079, p. 322*).—"A few cubic centimeters of milk have mixed with them one-fifth as much of a saturated aqueous solution of methylene blue. This colored milk is allowed to stand about 30 minutes; it is then centrifuged and the sediment spread on a glass slide. When dry it is ready for examination. In raw milk the microscopic field is stained a uniform blue in which appear clear areas which are either fat globules or leucocytes. The polymorphonuclear cells are irregular in outline, about 12 microns in diameter, and unstained or only slightly tinged. The sediment from milk heated to 60° C. or above presents a very different picture. The polymorphonuclear leucocytes are rounded up and shrunken so that they are only about 8 microns in diameter and the nuclei are deeply stained."

The significance of milk sugar for the hygienic judgment of milk, A. Gabathuler (*Ztschr. Fleisch. u. Milchhyg., 25, (1915), Nos. 7, pp. 97–100; 8, pp. 113–119; 9, pp. 135–140*).—The lactose of milk is subject to variations due to individual peculiarities of the animal, and also to the period of lactation. The amount is favorably influenced by rest but above all things it is dependent upon the condition of health of the mammary gland. The slightest functional disturbance is said to make itself felt in the milk sugar content.

At the beginning of lactation, the milk sugar content is low and from thence on it rises to a maximum point at the height of lactation, only to fall again at the end of lactation. Estrum seems only to exert a slight effect upon the milk sugar content, except that an increase is noted at the end for a short time. Neither does spraying affect the results, except that where the milk secreting function has been affected by a high grade of nymphomania it returns to its normal composition after ovariotomy. The salty taste of a milk is never due to an increased output of sodium chlorid, but sometimes to a low milk sugar content. The author believes that for the hygienic judging of milk, the milk sugar content must be taken into consideration.

Manufacture of sucrose from maize, J. Bohle (*Deut. Zuckerindus., 39 (1914), No. 24, pp. 538–540; abs. in Jour. Soc. Chem. Indus., 33 (1914), No. 13, pp. 704, 705*).—In a large scale experiment, maize grown in Tucuman, Argentina, was crushed in a double 3-roller mill. An extraction of 55 per cent by weight

was obtained, and the juice had a Brix reading of 15.9, a sucrose content of 8.75 per cent, and a purity of 55 per cent. After clarifying by the addition of lime and soda, allowing to settle, sulphiting to a slightly acid reaction, and boiling, the Brix reading was 14.7, the sucrose content 8.69 per cent, and the purity 59.1 per cent. The concentrated sirup did not crystallize readily in the pan, but after breaking the vacuum, and allowing the strike to stand for ten minutes, a fine grain separated, which on subsequently centrifuging and "covering" with steam gave a sugar with the composition of water 1.15, sucrose 97.6, ash 0.34, reducing sugars 0.31, and other organic matter 0.6 per cent. In a laboratory experiment with an extraction of 64.5 per cent by weight, and a sucrose content in the juice of 12.27 per cent, the yield of first and second sugars, calculated to 100° polarization, was 5.35 and 1.25 per cent respectively. It is concluded that the working up of maize juice in the factory presents no inconvenience, but that on the agricultural side there are considerable difficulties, namely, the necessity of harvesting within 18–21 days to avoid a great loss of sucrose by inversion; the brief duration of the point at which the maximum of sucrose is reached; and the sensitiveness of the plant to diseases and pests, especially in its early period of growth.

METEOROLOGY.

A note on the relation of climate to agriculture in California, A. H. Palmer (*Mo. Weather Rev., 43 (1915), No. 8, pp. 398–400*).—It is stated that "with the sole exception of those tropical conditions which involve continuous high temperature and excessive humidity, California has samples of the climates of every part of the world which permit successful agriculture." A statement, prepared by E. J. Wickson, showing the time of harvesting the principal crops of California is given, and emphasizes the fact that seedtime and harvest are practically continuous throughout the year.

"The mean annual temperatures range from 42.1 to 76° F., while extremes of —21 and 134° have been recorded in different parts of the State in the same year. The mean annual precipitation ranges from 2 to 113 in., with extremes at different stations ranging from no rainfall to 154 in. Altitude above the sea level rather than latitude controls the temperature, while altitude together with latitude control the precipitation. The southern and lower parts of the State are drier than the northern and higher portions. Summer and winter are terms synonymous with dry and wet periods, respectively, rather than with hot and cold periods. Most of the precipitation is of cyclonic origin, and since cyclones dominate the winter only, the agricultural portion of the State receives more than 90 per cent of its rainfall during that season. Generally speaking, topography is of more importance as a control of climate than is latitude."

It is pointed out that the terms "northern" and "southern" have little climatic and no agricultural application in California. The long growing season which prevails results in second and sometimes in third crops of considerable commercial importance, while differences in altitude make possible a long period during which fresh fruits and vegetables are procurable. From the standpoint of horticulture, which is the leading agricultural interest of the State, "the chief characteristics of California climate are (1) abundance of sunshine, (2) freedom from extremely low temperatures, and (3) an atmosphere with a low percentage of humidity. . . . The humidity, both absolute and relative, is high in winter and low in summer, just the reverse of that in the East. The dry

air of summer not only favors the access of light and heat, but it also permits certain chemical actions necessary for fruit ripening. Moreover, a consideration of some moment is the fact that it prevents certain fungoid diseases. . . . The period of greatest fruit growth is from June to October. The rest period in trees and vines just following the gathering of the fruit is a dry season climatically, not a cold season as in the East. . . . The soil moisture has its origin in the winter rains, when the trees and vines are inactive."

Climate of State College, Pennsylvania, W. Frear and H. D. Edmiston (*Pennsylvania Sta. Rpt. 1913, pp. 220–386, pls. 8*).—This is a summary and analysis of temperature records from 1880 to 1912, but particularly of the more complete records covering the years 1886 to 1912. Hourly, daily, monthly, seasonal, and annual temperatures and temperature variations are considered in detail. The station at which the observations were made is very near the geographic center of Pennsylvania in about latitude 40° 55′ N., and longitude 77° 51′ W. The elevation above sea level is about 1,200 ft. "The location is nearly 300 miles west from the Atlantic Ocean, just east of the main Appalachian range, separated thereby both from the great central valley of the Ohio and the Mississippi and also from the region of the Great Lakes; not sheltered by near-by mountains, in a country no longer densely wooded, on a swell open to the full sweep of the winds, yet tempered in cold, quiet weather by the drainage of the colder air into near-by hollows and vales."

The normal course of daily temperature through the years 1886 to 1912, inclusive, is shown in the following table:

Average daily temperature (°F.) 1886–1912.

Days of month.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
1	28.0	22.2	30.0	40.1	59.3	61.8	70.3	69.4	65.6	55.5	46.8	30.6
2	28.0	25.5	31.6	39.5	55.1	63.8	72.0	69.6	66.5	54.7	46.6	31.1
3	25.8	22.8	30.2	40.8	55.9	63.9	72.5	70.0	67.8	54.5	44.8	30.8
4	26.0	22.5	29.1	43.3	55.1	65.5	71.4	69.2	66.8	56.1	42.7	28.3
5	26.5	21.7	27.0	44.3	55.7	65.7	71.1	69.5	66.0	56.6	42.4	28.5
6	25.3	21.6	30.2	44.1	56.8	64.6	71.9	70.2	65.6	54.3	43.4	30.8
7	26.3	22.8	33.6	42.7	57.1	63.7	71.2	69.6	65.5	52.5	42.0	30.8
8	28.9	24.0	33.6	43.0	57.6	64.2	71.4	70.5	65.6	51.8	42.1	31.1
9	24.6	24.0	33.6	43.7	59.1	65.3	70.0	71.4	65.3	52.3	44.9	31.2
10	23.6	24.4	34.8	43.5	58.9	64.9	70.1	71.8	66.3	51.3	43.2	31.7
11	24.8	23.6	35.3	43.6	59.4	65.5	71.0	71.1	65.1	54.0	40.4	32.7
12	26.0	24.2	37.1	45.8	59.7	65.8	71.4	69.0	66.1	51.5	40.0	31.7
13	23.5	25.7	35.5	48.4	59.8	66.4	70.7	68.4	64.3	50.0	38.5	30.5
14	26.0	27.6	33.0	47.3	58.6	68.0	70.7	70.5	62.9	51.1	36.9	30.5
15	27.5	26.9	31.2	47.0	59.2	68.6	70.8	68.6	62.4	51.1	38.0	29.8
16	26.0	25.3	31.4	48.3	58.5	67.2	71.7	68.8	63.4	52.4	39.1	29.3
17	25.5	27.1	33.3	47.6	60.0	67.3	71.7	68.7	62.9	51.0	39.3	28.4
18	24.7	30.4	36.4	50.2	62.3	67.1	68.5	67.6	63.1	51.7	38.2	29.0
19	24.0	27.5	39.1	50.4	61.5	68.0	70.0	68.0	63.4	51.4	39.3	28.7
20	27.1	25.8	38.9	48.3	62.3	69.2	70.9	67.2	60.3	49.8	37.7	28.7
21	31.2	30.0	36.3	49.3	59.4	68.7	70.8	67.1	61.1	47.5	38.9	30.2
22	31.0	29.4	37.7	50.9	60.7	68.2	70.8	67.7	60.9	47.4	40.2	30.9
23	29.6	31.1	37.9	51.6	61.4	68.7	70.9	67.7	61.2	48.8	38.0	31.0
24	26.5	29.0	38.1	51.1	62.6	69.0	69.6	68.3	60.2	47.2	36.3	31.2
25	25.3	28.9	38.1	52.3	61.6	68.8	70.7	68.2	59.5	47.2	35.3	30.2
26	25.4	27.8	38.4	53.1	59.8	69.5	69.4	68.4	58.7	46.9	36.0	27.9
27	25.5	26.3	39.6	53.9	59.8	67.3	69.2	65.9	58.9	47.5	36.2	27.5
28	24.6	28.4	40.2	54.1	60.3	67.3	70.1	64.5	57.1	45.4	33.2	25.6
29	25.0	30.3	40.2	54.9	61.1	69.0	72.1	65.4	57.6	44.2	33.6	27.1
30	24.9	......	41.3	57.5	61.1	69.7	71.4	66.0	55.9	43.2	31.8	28.1
31	24.1	......	41.1	......	61.9	......	70.9	65.5	......	45.2	......	27.9

The table shows "that, while the annual course of temperature from season to season through the year is primarily determined by the increase and later by the decrease in length of the corresponding daylight periods, the influence of

cyclonic storms is still so pronounced that it is not eliminated in the daily normals for a period of twenty-seven years." The table further shows that "the coldest day of the average year was February 6, with a temperature of 21.6°; the hottest, July 3, with a temperature of 72.5°."

Data relating to the mean temperatures of the growing (April to September) and nongrowing (October to March) seasons 1880–1912 are summarized in the following table:

Summary of seasonal mean temperatures, 1880–1912.

	Growing season.	Non-growing season.		Growing season.	Non-growing season.
	° F.	° F.		° F.	° F.
Normal, 1880-1912	62.48	34.33	Differences between extremes	7.50	8.80
Highest	[1] 67.10	[2] 38.70	Average departure from normal	1.62	1.86
Lowest	[3] 59.60	[4] 29.80			

[1] 1899. [2] 1912-13. [3] 1888. [4] 1880-81.

"The sequence of exceptionally warm and cold seasons exhibits no such relations as to indicate that any simple meteorological law governs the relative extent of monthly and seasonal departures from their respective normals."

As regards the succession of seasons, the data indicate that "one extreme of temperature is rarely followed immediately by the opposite extreme. Of the eight cold winters none was followed by a warm spring, and only one by a warm summer; of the seven warm winters, more than half were followed by warm or average springs and by warm summers."

Since the comfort of man and the nature and growth of the fauna and flora of a region is more largely affected by the extent and frequency of its short-period temperature changes than by averages of longer periods, this phase of the subject is very fully dealt with.

The extreme daily range of temperature during each month of the period from 1886 to 1912 is shown in the following table:

Extreme daily range of temperature, 1886–1912.

Date.	Range.	Max.	Min.	Date.	Range.	Max.	Min.
	° F.	° F.	° F.		° F.	° F.	° F.
Jan. 13, 1895	42	37	−5	Aug. 10, 1887	39	84	45
Feb. 22, 1889	41	46	5	Aug. 28, 1886	39	79	40
Mar. 26, 1908	51	74	23	Sept. 5, 1893	43	87	44
Apr. 10, 1909	47	70	23	Oct. 16, 1888	44	58	14
May 1, 1903	44	76	32	Nov. 17, 1886	44	65	21
June 19, 1886	44	80	36	Dec. 11, 1886	48	59	11
June 29, 1886	44	88	44	Entire year, Mar. 26, 1908	51	74	23
July 25, 1893	34	91	57				

During the period 1886–1912, "the maximum temperature of the year occurred sixteen times in July, six in June, and five in August. While the maximum never occurred in September or May, it happened in six years out of the period that the maximum for one or other of these months was next to the highest for the year, and above that for two of the summer months of the respective

years." The annual mean temperature, 1881–1912 (omitting 1882, 1884, and 1885), was 48.39°. The absolute maximum, 1886–1912, was 99°, July 4, 1911, the absolute minimum —20°, February 10, 1899.

Temperature conditions at State College are stated to be characteristic of the upland of the region, but not representative of the temperature extremes occurring in the lowlands and small valleys of the vicinity. Consequently the records of the actual occurrence of frost include observations in the adjacent lowlands as well as at the college. These records show that "the average dates between heavy and light spring frosts and the corresponding frosts of the fall season for the years, 1888–1912, were: Last killing frost in spring, May 9; last light frost in spring, May 13; first light frost in fall, September 20; first heavy frost in fall, October 2; that is, the average period of growth for plants sensitive to frost was 130 days, the period for more hardy plants 146 days. The interval of light frost in the spring averaged only 4 days, but that of the fall 12 days. The period of safety for delicate plants is indicated, however, more exactly by the extremely unfavorable years, rather than by the average growing season. In 1910, the interval free from frost lasted only 103 days, from May 16 to August 27, and in 1912 for only 108 days, from June 9 to September 27. The shortest interval between killing frosts was in 1894, namely, 120 days, from May 29 to September 26. The longest interval between killing frosts appears in 1899, namely, 172 days from April 11 to September 30. The period, 1888–1912, has witnessed frost in every month of the year except July. This year's [1913] record indicates that only the period from June 9 to August 27, an interval of only 78 days, has been frost-free." The number of days of effective temperatures for plant growth (with a minimum temperature exceeding 42°) varied from 203 in 1892 to 231 in 1912. The average yearly number of such days was 217. The seasonal (May to September) number was 172. "In 10 years out of the 27 years, 1886–1912, the 90° maximum appeared, if at all, only for a single day at a time; in five other years, the longest consecutive period was two days; and only that of August, 1900, prolonged for seven days, was especially severe."

Climatological data for the United States by sections (*U. S. Dept. Agr., Weather Bur. Climat. Data, 2 (1915), Nos. 7, pp. 224, pls. 2, figs. 8; 8, pp. 224, pls. 2, figs. 10*).—These volumes contain, respectively, brief summaries and detailed tabular statements of climatological data for each State for July and August, 1915.

Monthly Weather Review (*Mo. Weather Rev., 43 (1915), Nos. 7, pp. 311–376, pls. 20, figs. 3; 8, pp. 377–435, pls. 23, figs. 13*).—In addition to weather forecasts, river and flood observations, and seismological reports for July and August, 1915; lists of additions to the Weather Bureau Library and of recent papers on meteorology and seismology; notes on the weather of the months; solar and sky radiation measurements at Washington, D. C., during July and August, 1915, by H. H. Kimball; condensed climatological summaries; and the usual climatological tables and charts, these numbers contain the following articles:

No. 7.—Note on the Distribution of Moisture in the Atmosphere, by W. R. Blair; Tables of Sun Spot Frequencies, 1901–1914, by A. Wolfer; Mistpoeffer, Uminari, Atmospheric Noises; Oceanic Noises, Uminari, by T. Terada; Cirrus Bands and the Aurora, by D. F. Manning; Eddy Motion in the Atmosphere, by G. I. Taylor; Nature of the Zodiacal Light, by F. Schmid; Hourly Pressures for Washington, D. C., 1891–1904 (illus.); Note on the Effects of Rain Gage Exposure (illus.), by W. G. Reed; Distribution of Thunderstorms in the United States, by W. H. Alex-

ander; New Hypsometric Map of the Russian Empire; The Hottest Region in the United States; Relation Between Departures from the Normal in the Strength of the Trade Winds of the Atlantic and Those in the Water Level of the Northern European Seas, by P. H. Gallé; The Robinson Anemometer, by K. Schreber; Report of the Work Carried Out by the Steamship "Scotia," 1913, by G. I. Taylor; Radium Content of Water from Gulf of Mexico, by S. J. Lloyd; Discussion on Antarctic Meteorology (illus.); Low Temperature of the Southern Hemisphere; Australian Rainfall, by H. A. Hunt (E. S. R., 33, p. 616); Influence of Weather Conditions on the Amounts of Nitric Acid and of Nitrous Acid in the Rainfall Near Melbourne, Australia, by V. G. Anderson (E. S. R., 33, p. 617); Serial Numbers of Weather Bureau Publications, by R. Seyboth; and Detection of Seismic Zones by Means of Barometric Gradient, by A. Nakamura.

No. 8.—Storm Frequency Changes in the United States (illus.), by H. Arctowski; A Uniform Thermometer Exposure at Meterological Stations for Determining Air Temperature and Atmospheric Humidity (illus.), by V. Köppen; Weather Bureau Terms Used to Designate Storms; Note on the Crushing of a Copper Tube by Lightning (illus.), by W. J. Humphreys; A Note on the Relation of Climate to Agriculture in California, by A. H. Palmer (see p. 114); Classification of American Summers, by H. F. Alciatore; Beach Fog and Fracto-Cumulus; Notes at Honolulu, Hawaii, during Solar Eclipse of August 10, 1915, by W. W. Wyatt; The Tropical Storm of August 10, 1915 (illus.), by H. C. Frankenfield; and Weather Conditions on the North Atlantic during August, 1914, by P. C. Day.

Meteorological observations at the Massachusetts Agricultural Experiment Station, J. E. OSTRANDER and D. POTTER (*Massachusetts Sta. Met. Buls. 321, 322 (1915), pp. 4 each*).—Summaries of observations at Amherst, Mass., on pressure, temperature, humidity, precipitation, wind, sunshine, cloudiness, and casual phenomena during September and October, 1915, are presented. The data are briefly discussed in general notes on the weather of each month.

Meteorological records for 1914 (*New York State Sta. Rpt. 1914, pt. 1, pp. 974–984*).—Tables are given showing tridaily readings at Geneva, N. Y., of standard air thermometers for each month of the year; daily readings of maximum and minimum thermometers at 5 p. m. for each month of the year; a monthly summary of maximum, minimum, and standard thermometer readings for the year; monthly and yearly maximum and minimum temperatures from 1883 to 1914, inclusive; average monthly and yearly temperatures since 1882; and rainfall by months since 1882.

Ohio weather for 1914, J. W. SMITH and C. A. PATTON (*Ohio Sta. Bul. 287 (1915), pp. 293–372, figs. 63*).—The temperature and precipitation throughout the State during each month are shown in charts. The usual summary tables are given showing temperature and rainfall at Wooster and throughout the State (1888–1914).

The mean temperature for the year at Wooster was 49.2° F.; for the State 50.9°. The highest temperature at the station was 95°, June 24 and July 12; for the State, 106°, July 12. The lowest temperature at the station was —18°, February 25; for the State, —24°, February 25. The annual rainfall at the station was 37.38 in.; for the State, 35.42 in. The number of rainy days at the station was 114; for the State, 106. The prevailing direction of the wind was southwest.

Meteorology, H. D. EDMISTON (*Pennsylvania Sta. Rpt. 1912, pp. 479–492, 805–826; 1913, pp. 387–396, 729–750*).—The observations here recorded are of the same character as those reported in previous years (E. S. R., 28, p. 115). The summary for 1911 and 1912 is respectively as follows:

Summary of meteorological observations at State College, Pa., 1911 and 1912.

Kind of observation.	Year.		Growing season (April-September).	
	1911	1912	1911	1912
Barometer (inches): Mean	30.069	30.019		
Temperature (degrees F.):				
Mean	50.4	48.2	64.7	62.8.
Highest	99.0 (July 4)	90.0 (June 29, July 7, 10).	99.0 (July 4)	90.0 (June 29, July 7, 10).
Lowest	5.0 Jan. 6)	17.0 (Jan. 14)	15.0 (Apr. 2)	25.0 (Apr. 4, 8).
Greatest daily range	39.0 (Nov. 12)	38.0 Apr.12)	37.0 (Sept. 4)	
Least daily range	3.0 (Apr. 4, Dec. 5)	2.0 (Feb. 12)		
Rainfall (inches)	46.39	39.08	26.30	23.21.
Number of days on which 0.01 inch or more rain fell	162	135	79	73.
Mean percentage of cloudiness	33	53.4	46	53.
Number of days on which cloudiness averaged 80 per cent or more	109	87	38	42.
Last frost in spring			May 5	April 28.
First frost in fall			Sept. 14	Sept. 27.

SOILS—FERTILIZERS.

Soil survey of Cleburne County, Alabama, H. G. LEWIS, C. S. WALDROP, and F. W. KOLB (*U. S. Dept. Agr., Advance Sheets Field Operations Bur. Soils, 1913, pp. 38, fig. 1, map 1*).—This survey, made in cooperation with the State of Alabama and issued May 15, 1915, deals with the soils of an area of 363,520 acres in eastern Alabama, comprising portions of the Appalachian Mountain and Plateau province and the Piedmont Plateau province. The topography varies from rough, hilly, and mountainous to gently rolling. The area is drained through the Tallapoosa, Little Tallapoosa, and Coosa rivers. The soils of the county are residual in origin, and the Piedmont soils are considered the most important agriculturally. Twenty-one soil types, of eleven series, are mapped, of which the Talladega slate loam is the most extensive, with the Louisa gravelly loam second. The Talladega series covers 55 per cent of the county.

Soil survey of Russell County, Alabama, N. E. BELL, L. A. HURST, and J. M. SNYDER (*U. S. Dept. Agr., Advance Sheets Field Operations Bur. Soils, 1913, pp. 50, fig. 1, map 1*).—This survey, made in cooperation with the State of Alabama and issued May 17, 1915, deals with the soils of an area of 419,200 acres in the coastal plain of eastern Alabama, the topography of which ranges in general from undulating to rolling. The county is drained through tributaries of the Chattahoochee and Alabama rivers.

The upland soils of the county are formed from materials laid down on the floor of the Gulf, which at one time covered the region. Thirty-eight soil types, of twelve series, and three miscellaneous types are mapped, of which the Susquehanna very fine sandy loam, clay, fine sandy loam, and sandy loam, the Norfolk sand, and the Leaf fine sandy loam are the predominating types. It is stated that the soils of the county are generally in need of lime and organic matter.

Soil Survey of Pope County, Arkansas, C. LOUNSBURY and E. B. DEETER (*U. S. Dept. Agr., Advance Sheets Field Operations Bur. Soils, 1913, pp. 51, fig. 1, map 1*).—This survey, issued June 3, 1915, deals with the soils of an area of 529,920 acres in central Arkansas. The topography of the northern half of the county is rough and rugged, while that of the southern half is more level and less dissected. The drainage is mainly into the Arkansas River. The soils of the county comprise upland soils of residual origin and alluvial stream bottom

soils. Including rough, stony land and river wash, 30 soil types, of 11 series, are mapped, of which the Hanceville fine sandy loam and stony loam and the rough stony land are the most extensive. It is stated that most of the soils, particularly the upland types, are in need of lime.

Reconnoissance soil survey of the Sacramento Valley, California, L. C. HOLMES, J. W. NELSON, ET AL. (*U. S. Dept. Agr., Advance Sheets Field Operations Bur. Soils, 1913, pp. 148, pls. 3, fig. 1, map 1*).—This survey, made in cooperation with the California Experiment Station and issued April 26, 1915, deals with the soils of an area of 4,015,360 acres, comprising the north half of the Great Interior Valley of California. The area is drained by the Sacramento and San Joaquin rivers. The topography of the valley is that of a structural trough formed by the uplift of the surrounding mountains.

The soils of the valley are derived from or consist of four classes of material, namely, (1) residual material, (2) old valley-filling material, (3) recent alluvial fan and alluvial material, and (4) wind-deposited material. The soils as they exist at present are largely the product of the weathering of the older of these materials, while the very recently deposited material has been changed in place very little. Including five miscellaneous soils and a number of undifferentiated types, sixty-seven soil types are mapped in the area, of which the San Joaquin loams, the Willows clay adobe, Madera loams, Sacramento clays, Stockton clay adobe, and muck and peat are the most extensive single types. It is stated that large areas in the valley are affected by injurious quantities of alkali, the largest amount being found on the west side of the valley.

Soil survey of Stewart County, Georgia, D. D. LONG, M. W. BECK, E. C. HALL, and W. W. BURDETTE (*U. S. Dept. Agr., Advance Sheets Field Operations Bur. Soils, 1913, pp. 66, pls. 2, fig. 1, map 1*).—This survey, made in cooperation with the Georgia State College of Agriculture and issued May 28, 1915, deals with the soils of an area of 298,880 acres in the Coastal Plain region of southwestern Georgia. The topography ranges from level or gently undulating to rough and broken, and the surface in general is badly dissected by erosion, leaving level interstream areas.

The soils are divided into upland soils of sedimentary origin and old stream terrace and overflowed first bottom soils, both of alluvial origin. The soils range in texture from loose, coarse, incoherent sands to heavy, sticky, impervious clays. Including meadow, swamp, and rough gullied land, forty-six soil types of twelve series are mapped, of which the Susquehanna clay is somewhat the most extensive. The Ruston is the most extensive series. "With a few exceptions, the several types of soil occur in complicated areas, and no very large areas of any one type are found."

Soil survey of Delaware County, Indiana, L. A. HURST and E. J. GRIMES (*U. S. Dept. Agr., Advance Sheets Field Operations Bur. Soils, 1913, pp. 31, fig. 1, map 1*).—This survey, made in cooperation with the Indiana Department of Geology and issued May 29, 1915, deals with the soils of an area of 250,880 acres in east-central Indiana, the topography of which varies from level to undulating and in some places broken. The Mississinewa and West Fork of White River with their tributaries drain the county.

Glacial till, consisting chiefly of clay intermingled with sand, gravel, and silt covers the entire county to a depth of 50 to 200 ft., and is the source of the upland soils. "The bottom lands are derived from reworked and redeposited materials which represent wash from the uplands." Including muck, eight soil types of five series are mapped, the Miami silt loam covering 67.8 per cent of the county and the Clyde silty clay loam 21.3 per cent.

Soil survey of Hendricks County, Indiana, W. E. THARP and E. J. QUINN (*U. S. Dept. Agr., Advance Sheets Field Operations Bur. Soils, 1913, pp. 38, fig.*

1, map 1).—This survey, made in cooperation with the Indiana Department of Geology, was issued May 13, 1915. It deals with the soils of an area of 261,120 acres in central Indiana. The topography of the northern and western parts of the county is undulating to very gently rolling, while in the central and southern parts the relief is stronger. The natural drainage of the northern and northeastern parts is poor, but that of the southern part is good. Thoughout the county the prevailing surface material is a silt or silty clay ranging from 2 to 3 ft. in depth and overlying a deep deposit of bowlder clay. Twelve soil types, of four series, are mapped in the county, the Miami silt loam covering 69.6 per cent of the area.

Soil survey of Montgomery County, Kansas, F. V. Emerson and C. S. Waldrop (*U. S. Dept. Agr., Advance Sheets Field Operations Bur. Soils, 1913, pp. 36, pl. 1, figs. 2, map 1*).—This survey, made in cooperation with the Kansas College and Station and issued April 17, 1915, deals with the soils of an area of 412,160 acres in southeastern Kansas. In general, the eastern two-thirds of the county is prairie and the western third hilly. Except for some of the river soils, the surface drainage is generally good.

The soils of the county include types of residual, colluvial, and alluvial origin. Twenty-one soil types, of eight series, are mapped, of which the Oswego silt loam, a residual type, is the most extensive single type. The Bates series of residual soils, including very fine sandy loam, loam, stony loam, shale loam, gravelly loam, and very fine sand, is, however, the most extensive series. The Verdigris alluvial soils are said to be comparatively light, well drained, and probably the most productive soils in the county. It is stated that nearly all of the soils need humus and that a number of the soils, especially the upland types, are acid. Underdrainage for the large areas of heavy, poorly drained soils, and the use of systematic rotations, including some leguminous crop, for all soils are also suggested as beneficial measures.

The soils of Kentucky, S. D. Averitt (*Kentucky Sta. Bul. 193* (*1915*), *pp. 129–164, pl. 1*).—This bulletin gives brief statements of the fundamental facts in regard to soils, plant food, and fertility, together with explanations of terms and methods of analysis used, and gives tables of analyses of samples of 388 representative soils of the 10 soil areas of Kentucky, together with a general discussion of fertility requirements.

The 10 soil areas of the State cover approximately 41,000 square miles. The following table gives average analyses of the soils of each of the areas:

Average analyses of Kentucky surface soils to a depth of 7 in.

Area.	Total nitrogen.	Total phosphorus.	Total potassium.	Available [1] phosphorus.	Available [1] potassium.
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
Trenton, 1,200 square miles	0.189	0.470	1.31	0.17900	0.0160
Cincinnatian, 7,900 square miles	.159	.096	1.60	.00300	.0180
Silurian and Devonian, 1,800 square miles	.124	.055	1.19	.00100	.0110
Waverly, 4,400 square miles	.098	.032	.98	.00070	.0170
St. Louis, 6,000 square miles	.105	.044	1.41	.00090	.0160
Chester, 2,000 square miles	.085	.035	1.33	.00030	.0110
Western coal field, 4,500 square miles	.099	.038	1.46	.00095	.0140
Eastern coal field, western part, 2,000 square miles	.107	.031	.91	.00065	.0130
Eastern coal field, central and eastern part, 8,000 square miles	.149	.063	1.71	.00230	.0180
Quarternary, 2,350 square miles	.097	.049	1.55	.00130	.0150
River alluvium, 750 square miles	.165	.096	1.72	.00490	.0195

[1] Soluble in N/5 nitric acid.

All the areas, with the exception of the Trenton, Cincinnatian, and river alluvian, are considered to be very deficient in phosphorus and usually deficient in nitrogen. It is stated that "so far as field experiments have been made in the State at large, potassium has not been shown to be a limiting element on any well-drained soil in which there was a good supply of organic matter. . . . The cultivated soils of all the areas are inclined to acidity, especially the subsoils and badly drained soils. . . . In the bluegrass region nitrogen is the only limiting element in the production of profitable crops. In all other sections of the State phosphorus and nitrogen are limiting elements. The soils of the Chester, the Waverly, and the western edge of the eastern coal field are, on the whole, the least fertile soils of the State."

Soils of Graves County, S. C. JONES (*Kentucky Sta. Bul. 194 (1915), pp. 169–197, pl. 1*).—This bulletin deals with the origin, characteristics, mechanical and chemical composition, crop adaptations, and fertility requirements of an area of 540 square miles in the so-called Purchase Region in that portion of Kentucky lying west of the Tennessee River.

Three phases of topography are represented in the area, namely, bottom lands, hilly lands, and undulating table-lands and broad ridges. Graves County is covered entirely by transported soils which have been derived directly from glacial till and loess and are fairly typical of the Purchase Region. The yellow brown silt loam covering 43.39 per cent of the area is the most extensive type, followed in order by the yellow silt loam covering 36.13 per cent, the light brown silt loam covering 20.28 per cent, and the gray clay loam covering 0.2 per cent of the area. Chemical analyses of the soil types (soil and subsoil) are reported.

The results of these analyses are taken to indicate that nitrogen is the limiting element in the soils, particularly for grain crops, while where legumes are grown phosphorus is the limiting element. The soils are low in lime and rather strongly acid, especially the gray, poorly drained soils, but they are all relatively well supplied with potash.

The chief factors to be considered in improving and maintaining the fertility of Graves County soils are enumerated as prevention of soil erosion; practice of crop rotation; improvement of pasture land; increasing the organic matter, nitrogen, and phosphorus content of the soil; liming; and drainage.

A section by A. M. Peter reporting analyses showing the composition of the soil of the Mayfield experiment field and of three type soils is appended.

Soil survey of Jones County, Mississippi, A. L. GOODMAN and E. M. JONES (*U. S. Dept. Agr., Advance Sheets Field Operations Bur. Soils, 1913 pp. 35, pl. 1, fig. 1, map 1*).—This survey, made in cooperation with the State of Mississippi and issued April 9, 1915, deals with the characteristics of the soils of an area of 445,440 acres in southeastern Mississippi. The topography of the uplands varies from flat or gently undulating and rolling to hilly and ridgy. The stream bottoms and terraces are prevailingly flat. The county is drained to the south, the eastern part having good surface drainage. The western part contains a large area in which the slopes under cultivation are subject to erosion.

The soils of the county include upland, terrace, and bottom land types of varied textures, the first being of sedimentary origin and the two last of alluvial origin. Twenty-four soil types, of eleven series, are mapped, the uplands representing five series, the terraces three series, and the bottoms three series. The Ruston soils of the uplands, including fine sandy loam, sandy loam, and gravelly sandy loam, are the most extensive, covering nearly half the county. The Cahaba series is said to be the best of the terrace series. All the bottom soils are poorly drained. It is stated that the soils of the county are adapted to a wide range of crops.

Soil survey of Greene County, Missouri, H. H. KRUSEKOPF and F. Z. HUTTON (*U. S. Dept. Agr., Advance Sheets Field Operations Bur. Soils, 1913, pp. 38,*

fig. 1, map 1).—This survey, made in cooperation with the Missouri Experiment Station and issued June 7, 1915, deals with the soils of an area of 426,880 acres in southwestern Missouri which in general comprises a broad plain. The topography varies from smooth to hilly, although prevailingly it is gently rolling. The county is drained by the Sac and the James Rivers and Pomme de Terre and Wilson Creeks.

The soils comprise residual upland soils derived mainly from cherty limestone, and alluvial soils formed of material washed mainly from local upland soils. The soils consist of silt with very little sand or clay and are well drained. "Like the soil, the subsoil has a varying proportion of stone and gravel intimately mixed with other constituents." Sixteen soil types, of nine series, are mapped, of which the Crawford gravelly loam and silt loam are the predominating types.

Soil survey of Nodaway County, Missouri, E. S. Vanatta, E. W. Knobel, and W. I. Watkins (*U. S. Dept. Agr., Advance Sheets Field Operations Bur. Soils, 1913, pp. 31, fig. 1, map 1*).—This survey, made in cooperation with the Missouri Experiment Station and issued May 5, 1915, deals with the soils of an area of 562,560 acres in northwestern Missouri. The county comprises three general physiographic divisions, namely, the uplands, which are the most extensive; the terraces; and the bottom lands. It occupies a rolling prairie region and the topography ranges from nearly level to rough and broken. The drainage is mainly through the Nodaway, One Hundred and Two, and Platte rivers.

The soils of the county fall into two general groups, the upland soils of glacial and loessial origin, and the bottom-land soils. Ten soil types, of seven series, are mapped, of which the Marshall silt loam is the most extensive. The Shelby loam is second in extent and the Wabash silt loam, with a colluvial phase, third. "The soils of Nodaway County are naturally strong and productive, and commercial fertilizers are not extensively used."

Soil survey of Perry County, Missouri, B. W. Tillman and C. E. Deardorff (*U. S. Dept. Agr., Advance Sheets Field Operations Bur. Soils, 1913, pp. 34, fig. 1, map 1*).—This survey, made in cooperation with the Missouri Experiment Station and issued June 5, 1915, deals with the soils of an area of 295,680 acres in eastern Missouri which comprises upland and lowland, the former covering about seven-eighths of the total area of the county. The topography of the upland varies from rolling to hilly, while the lowland is a generally smooth plain. The county is drained by tributaries to the Mississippi River, the uplands being well drained.

The upland soils are residual, largely from limestone, and the lowland soils are alluvial derived from wash from the uplands. Twenty soil types, representing eleven series, are mapped, of which the Hagerstown silt loam and the Tilsit silt loam are the predominating types. It is stated that in some places considerable soil erosion has taken place, especially in areas of the Tilsit silt loam.

Soil survey of Oneida County, New York, E. T. Maxon, M. E. Carr, and E. H. Stevens (*U. S. Dept. Agr., Advance Sheets Field Operations Bur. Soils, 1913, pp. 59, fig. 1, maps 2*).—This survey, made in cooperation with the New York State College of Agriculture and issued May 22, 1915, deals with the soils of an area of 784,640 acres in central New York which comprises two broad upland regions separated by an old lake bed plain and glacial river channel. The county is drained through Oneida Lake and the Black, Chenango, Susquehanna, Mohawk, and Hudson rivers.

The soils range in texture from light sands and gravels to heavy clays and, with reference to origin, are divided into glacial, alluvial and lacustrine, residual, and cumulose soils. Fifty-eight soil types, of nineteen series, are recognized, of which the Mohawk and Ontario loams are the most extensive single types. It is

stated that the glacial till upland soils, having a gently rolling to hilly topography and good drainage, are by far the most extensive and important in the county.

Soil survey of Randolph County, North Carolina, R. B. HARDISON and S. O. PERKINS (*U. S. Dept. Agr., Advance Sheets Field Operations Bur. Soils, 1913, pp. 34, fig. 1, map 1*).—This survey, made in cooperation with the North Carolina Department of Agriculture and issued April 8, 1915, deals with the soils of an area of 479,360 acres in central North Carolina, the topography of which is gently rolling to hilly and semimountainous. Uharie and Deep rivers drain the greater part of the county and the south-central part is drained by the east and west prongs of Little River.

The soils of the county are derived mainly from two rock belts, the most important of which is closely associated with the Carolina Metamorphic Slate and Volcanic Belt and extends over about three-fourths of the county. In the northern end of the county and a larger part of the eastern section the rocks are mainly granite with some intrusive rocks. Fifteen soil types, of six series, are mapped, of which the Georgeville series, including silt loam, silty clay loam, and stony loam is the most extensive. Commercial fertilizers are in general use throughout the county and corn and wheat are the most important crops. Repeated deep plowing of the soils followed by intensive surface tillage is necessary, especially for wheat growing. "Best results with crop rotations are had where . . . clover or cowpeas can be turned under at the time of breaking the land and where a liberal application of lime is made either immediately before or immediately after breaking."

Soil survey of Stark County, Ohio, C. N. MOONEY, H. F. TUTTLE, and A. BONAZZI (*U. S. Dept. Agr., Advance Sheets Field Operations Bur. Soils, 1913, pp. 39, fig. 1, map 1*).—This survey, made in cooperation with the Ohio Experiment Station and issued March 15, 1915, deals with the soils of an area of 371,200 acres in northeastern Ohio, the topography of which is rolling to hilly. The drainage is into the Ohio River through the Tuscarawas and Mahoning rivers. The soils include upland, terrace, and flood plain soils of residual, glacial, and alluvial origin. Including muck and peat, nineteen soil types, of eight series, are mapped, of which the Wooster silt loam is the most extensive. The Volusia series is second in extent.

The composition of the soils of the Texas Panhandle, G. S. FRAPS (*Texas Sta. Bul. 173 (1915), pp. 5–25*).—This bulletin, the fourth of a series (E. S. R., 30, p. 420), contains a description of the soil types of 26 counties in the Texas Panhandle, with notes on their present agricultural uses and productiveness, and chemical analyses of about 57 samples of these types, together with an interpretation of the results. The author concludes that most of these soils are well supplied with phosphoric acid, potash, and lime, while nitrogen appears to be the element most liable to become deficient.

Soil survey of Logan and Mingo counties, West Virginia, W. J. LATIMER (*U. S. Dept. Agr., Advance Sheets Field Operations Bur. Soils, 1913, pp. 30, fig. 1, map 1*).—This survey, made in cooperation with the West Virginia Geological Survey and issued May 8, 1915, deals with the soils of an area of 557,440 acres in southwestern West Virginia, the topography of which is rough and broken with narrow stream valleys containing very little smooth bottom land.

The soils of the area fall into three general groups, namely, upland or residual soils, terrace or old alluvial soils, and first bottom or recent alluvial soils. Nine soil types, representing four series, are mapped, the Dekalb stony silt loam occupying 88.9 per cent of the area.

Deep versus ordinary plowing, C. F. NOLL (*Pennsylvania Sta. Rpt. 1913, pp. 39–47, pl. 1*).—Comparative tests of a deep-tilling machine and ordinary

moldboard plows on a deep, well-drained soil varying in texture from clay loam to gravelly silt loam are reported, the crops for which plowing was done being corn, oats, barley, wheat, and alfalfa.

The deep-tilling machine is a double-disk plow with 24-in. disks, the front disk being a few inches to the land side of the rear disk and not so deep. It cuts from 4 to 8 in. deep and throws the soil over into the furrow. The rear disk penetrates 6 to 9 in. deeper and mixes the plowed soil thoroughly.

Eight plats 35.5 ft. wide, varying in length from 982.5 ft. to 1,000 ft. long, were plowed at first, later being made 957.2 ft. long and comprising 0.78 of an acre each. Timothy sod was plowed for corn in the fall of 1909 and the spring of 1910, two plats being plowed with each implement in the fall and two in the spring. In the fall of 1910 and the spring of 1911 the corn stubble land was plowed in the same way and in the spring four plats were seeded to oats and four to beardless barley and alfalfa. In the fall of 1911 the four plats which had received oats were plowed and seeded to wheat, two plats being plowed with each implement. Under these conditions the two kinds of plowing gave practically the same results for all the crops grown.

The draft of the deep-tilling machine averaged in three sets of trials 1,727, 1,202, and 937 lbs., respectively, and the draft of the moldboard plow in the same trials in the order given averaged 655, 424, and 378 lbs. The draft of the deep-tilling machine per square foot of cross section of furrow averaged in the order given 1,512, 856, and 970 lbs. and that of the moldboard plow in the same order 962, 680, and 531 lbs.

Influence of dynamiting on soils, W. R. WHITE (*Pennsylvania Sta. Rpt. 1913, pp. 703–725, pls. 4, figs. 3*).—Experiments conducted to determine the influence of dynamiting on (1) the physical condition of soils, (2) soil moisture and drainage, (3) newly planted fruit trees, (4) mature trees, (5) field crops, and (6) insects in the soil are reported. The soils used were the Hagerstown clay loam and Volusia silt loam.

From these experiments it is stated that "while the results . . . can not be taken as conclusive for all conditions, yet they may indicate that the useful application of dynamite as a soil improver is limited. Its usefulness may depend largely upon local conditions. No definite benefits were derived from its use in either orchard or field crops. What it might do under different conditions, or over longer periods, is yet to be determined. One pond was drained and the other was not. Its usefulness in shooting an open ditch, blasting bowlders, and blowing stumps can not be questioned. It may be very useful in draining land where no outlet can be found for a tile drain. How permanent its effect may be is not known. As to destroying insects [ants], it has not proved to be of any use. It is probably safe to conclude that the application of dynamite as a soil improver is greatly limited and that it would always be advisable to try it out in a small way before investing much money in its use."

Effect of alkali salts in soils on the germination and growth of crops, F. S. HARRIS (*U. S. Dept. Agr., Jour. Agr. Research, 5 (1915), No. 1, pp. 1–53, figs. 48*).—Investigations conducted at the Utah Experiment Station on the effect of the chlorid, sulphate, nitrate, and carbonate of potassium, and sodium, the chlorid of calcium, the sulphate, chlorid, and nitrate of magnesium, and the carbonate of ammonium, singly and in different combinations and in concentrations varying by degrees from 0 to 10,000 parts per million, on the growth of barley, oats, wheat, alfalfa, sugar beets, corn, and peas in loam soils and sand are reported, the purpose of the study being to determine the quantity of various alkali salts necessary in the soil to reduce the growth of crops beyond the point of profitable production. About 18,000 determinations are summarized.

In preliminary experiments with wheat and sugar beets on a loam soil, using the chlorid, carbonate, and sulphate of sodium and magnesium sulphate, it was found that the toxicity of sodium chlorid was relatively high when compared with that of the other salts, and that there was germination and growth with considerably more sodium carbonate than sodium chlorid. Magnesium sulphate was only slightly toxic, while sodium sulphate in the same amount was more toxic, but permitted the production of fair crops. It was also found that the number of seeds germinating, the average height of plants, and the dry matter produced decreased with the increased concentration of the alkali. The plants appeared able to endure alkali better with a fair supply of moisture in the soil than where the soil was dry. Salts were more toxic when added in solution than when mixed with the dry soil. In a sand soil sodium carbonate was more toxic than sodium chlorid.

In the main experiments it was found that only about half as much alkali was required to prohibit the growth of crops in sand as in loam. Crops varied greatly in their relative resistance to alkali salts, but for the ordinary mixtures of salts it is considered probable that barley is the most resistant in the seedling stage, followed in order by oats, wheat, alfalfa, sugar beets, corn, and Canada field peas.

The action of the various salts in soils was somewhat different from that observed in solution cultures. Plants were able to endure much stronger chlorids and nitrates in solution cultures than in the soil, while the carbonates retarded growth more in solution than in the loam, but not as much as in the sand. The number of plants alive at the end of three weeks decreased as the concentration of the solution increased. There was a corresponding decrease in number of leaves per plant, height of plants, length of roots, weight of tops, and weight of roots as the concentration of salts increased. In the cultures in which no salts were added, the height of plants, the length of roots, and the dry matter produced were not so great as in cultures containing salts in low concentrations. These results are taken to indicate the inadvisability of applying too widely to the soil the results obtained with solution cultures of alkali.

The period of germination of seeds was considerably lengthened by the presence of soluble salts in the soil. The anion, not the cation, was found to determine the toxicity of alkali salts in the soil. Of the anions used the chlorid was decidedly the most toxic, while sodium was the most toxic base. The injurious action of alkali salts was not in all cases proportionate to their osmotic pressures. The order of toxicity of soluble salts in the soil was found to be as follows: Sodium chlorid, calcium chlorid, potassium chlorid, sodium nitrate, magnesium chlorid, potassium nitrate, magnesium nitrate, sodium carbonate, potassium carbonate, sodium sulphate, potassium sulphate, and magnesium sulphate. The antagonistic effect of combined salts was not so great in soils as in solution cultures.

It is thought probable that lands containing more than about the following percentages of soluble salt are not suited, without reclamation, to produce ordinary crops: In loam, chlorids 0.3 per cent, nitrates 0.4 per cent, carbonates 0.5 per cent, and sulphates above 1 per cent; and in coarse sand, chlorids 0.2 per cent, nitrates 0.3 per cent, carbonates 0.3 per cent, and sulphates 0.6 per cent.

A bibliography of cited literature is appended.

The effect of organic compounds in pot experiments, G. S. Fraps (*Texas Sta. Bul. 174 (1915), pp. 13*).—Pot culture experiments on several unproductive soils to determine the extent of the harmful effect on corn and sorghum of additions of dihydroxystearic acid at rates of from 500 to 1,200 parts per million, of vanillin, quinone, and cumarin at rates of from 100 to 2,000 parts per million, and the effect of phosphatic and nitrogenous fertilizers, carbon black, and

pyrogallic acid on the injurious influence of the organic compounds, are reported.

It was found that "impure dihydroxystearic acid has little injurious effect upon corn or sorghum grown in pot experiments when applied before planting at the rate of 500 parts per million of soil. . . . Vanillin and quinone applied to the soil before planting at the rate of 100 parts per million of soil injured the growth of only one of eight crops. . . . Six successive additions of cumarin, vanillin, or quinone at the rate of 100 parts per million did not kill the plants."

A comparison of these results with those of water culture experiments by others showed that vanillin, cumarin, and quinone are much less injurious in soil than in water cultures. This led to the conclusion that the results of soil and water culture experiments may differ widely. It was further found that vanillin and cumarin were oxidized in the soil, a considerable portion disappearing in two weeks and only a little remaining until the end of the experiments.

Little evidence was obtained to show that fertilizers overcome the injurious action of cumarin, vanillin, or quinone. "Pyrogallic acid and carbon black showed no beneficial action in pot experiments, while acid phosphate or other fertilizer was decidedly beneficial to the soils and produced decided increases. The conclusion is that these poor soils need the plant food supplied by the fertilizers and that the action of the fertilizer is to supply plant food and not to overcome toxic substances."

The formation of carbon dioxid and nitrates in the presence of large amounts of carbohydrates, J. G. LIPMAN, A. W. BLAIR, H. C. MCLEAN, and L. K. WILKINS (*New Jersey Stas. Rpt. 1914, pp. 220, 221*).—Laboratory experiments with an acid loam soil to which dextrose was added at the rate of 3 gm. per 100 gm. of soil showed that nearly ten times as much carbon dioxid was evolved from the portions of soil receiving dextrose as from those receiving none. On the other hand, there was approximately 122 times as much nitrate in the nondextrose portions as in the dextrose portions.

Bacteriology of the general fertilizer plats, G. C. GIVEN and L. G. WILLIS (*Pennsylvania Sta. Rpt. 1912, pp. 441–454, figs. 5*).—Studies on the bacterial numbers and on ammonification in several plats of clay loam soil, which had undergone varying cultural and fertility treatment for 30 years, are reported.

A slight relationship was found between moisture content of the soil and number of soil bacteria growing on nutrient agar. Temperature was more of a limiting factor on bacterial numbers than moisture content, one of the lowest counts being obtained from very cold, but not frozen, soil. Fairly high counts were, however, obtained from frozen soil. Little or no relation was established between bacterial numbers and the size of wheat crop.

In ammonification experiments with cotton-seed meal ,it was found that ammonification was very similar in rate and amount in soils receiving widely varying treatment.

A list of references to literature bearing on the subject is appended.

Bacteriology of the general fertilizer plats.—III, Ammonifications, G. C. GIVEN (*Pennsylvania Sta. Rpt. 1913, pp. 200–206, pls. 7*).—In continuation of the above experiments studies of ammonification and nitrification are reported.

Further ammonification experiments, using cotton-seed meal and dried blood, to determine the effects of the soils from the different plats upon the activity of ammonifying organisms derived from a highly productive soil showed in all cases a steady increase in ammonia production up to the seventh day.

Nitrification experiments with these soils using ammonium sulphate showed that "the same soils which apparently had no influence upon the vigor of the

ammonifying organisms have very different effects upon the nitrifying organisms, the soil from acid plats especially inhibiting their functions to a considerable extent, though not wholly suspending them."

The nitrification investigations are being continued.

Some results of thirty years' soil treatment with barnyard manure, W. H. McIntire (*Pennsylvania Sta. Rpt. 1912, pp. 57-63*).—Field experiments with corn, oats, wheat, and hay on a clay loam soil of limestome origin, described in a previous report (E. S. R., 20, p. 1017), to determine the effect on soil and crop of barnyard manure applied in amounts of 6, 8, and 10 tons per acre, and of 6 tons of manure supplemented by 2 tons of lime applied only to corn, are reported.

The largest returns per ton of manure were secured from plats receiving 6 tons of manure and the smallest from those receiving 10 tons. The addition of 2 tons of burnt lime once in four years caused the yield resulting from the application of 6 tons of manure to approximate the yield from 10 tons and lessened the accumulation of humus in the soil. The accumulation of organic matter was greatest upon plats receiving 6 tons of manure and least on those receiving 10 tons.

The soil under mature clover was richest in organic matter, followed in order by soil under young clover, soil containing clover residues, and soil under oats. The soil under mature clover had the highest nitrogen content, followed in order by the soil containing clover residues, soil under young clover, and soil under oats.

Liming, in addition to manure, increased the accumulation of nitrogen in the soil, the greatest nitrogen accumulation being with the 8-ton application and the least with the 10-ton application. The greatest occurrence of nitrate was observed in the limed soil under corn, followed in order by grass soil, wheat stubble soil, and oat stubble soil. The soils receiving 6 and 10 tons of manure were practically identical as regards nitrate content, while the soil receiving 8 tons of manure had the smallest nitrate content.

Summary of the results obtained from experiments with commercial fertilizers, yard manure, lime, etc., extending through a period of thirty years, T. F. Hunt, F. D. Gardner, and C. F. Noll (*Pennsylvania Sta. Rpt. 1912, pp. 83-119, pl. 1, figs. 6*).—This report gives the detailed results of the last 5 years of a series of 30 years' fertilizer experiments on a clay loam soil, the first 25 years' results of which have been previously noted (E. S. R., 21, p. 220), and summarizes the more salient facts brought out by the 30 years' work. The crops were corn, wheat, oats, and grass. The main results of the 30 years' work are as follows:

The application of potash and nitrogen singly had no material effect upon crop yield, while phosphoric acid when applied alone had a distinct influence in maintaining the productiveness of the soil. In spite of the beneficial results given by phosphoric acid, the results as a whole indicate that it is a poor practice to apply a single fertilizer continuously to this soil. Complete fertilization gave an increased crop yield during 30 years of 55.2 per cent. "When potash was applied alone no increase resulted. When applied with phosphoric acid a material increase resulted over the application of phosphoric acid alone. In like manner, but in less marked degree, owing to bacterial agencies supplying nitrogen, when nitrogen was applied with phosphoric acid or potash or with both, increased yields resulted."

Sodium nitrate as a source of nitrogen almost without exception gave better results than either dried blood or ammonium sulphate during the 30 years. The sodium nitrate and dried blood were as effective the last 5 years as during

the first 5 years, but there was a marked decrease in the effectiveness of the ammonium sulphate, especially when larger amounts were used. With a rotation containing clover more than 24 lbs. of nitrogen per acre brought comparatively little increase in yield.

Barnyard manure and a complete commercial fertilizer maintained the crop-producing power of the soil about equally well. The excessive use of quicklime produced only a slight increase in crop yield. The soil receiving ground limestone, with one exception, gave a higher annual crop yield than any soil receiving no treatment.

The influence of bacteria in manure on the decomposition of green manure (legume and nonlegume), J. G. Lipman, A. W. Blair, H. C. McLean, and L. K. Wilkins (*New Jersey Stas. Rpt. 1914, pp. 223–226*).—This is an account of a continuation of experiments previously described (E. S. R., 32, p. 514), the results of which indicate "that the bacteria conveyed in small quantities of manure do have a beneficial effect in the decomposition of the green manure crops. When the green manure crop is a legume, the additional nitrogen thus secured tends to obscure the effects of the manure. The legume is more effective in increasing the yield and also in maintaining the nitrogen supply of the soil than the nonlegume, and there is good ground for believing that the nitrogen in the former is more available than in the latter."

Pot experiments on the availability of nitrogen in mineral and organic compounds, J. G. Lipman, A. W. Blair, H. C. McLean, and L. K. Wilkins (*New Jersey Stas. Rpt. 1914, pp. 207–220*).—The object of these experiments, which supplement plat experiments previously noted (E. S. R., 31, p. 124), was to determine the availability of a number of organic and inorganic nitrogenous fertilizers as compared with that of sodium nitrate. In the first four experiments pots containing 20 lbs. of sand were used.

A comparison of sodium nitrate, ammonium sulphate, tankage, and cotton-seed meal, when added to barley in sand, in amounts equivalent to 616 mg. of nitrogen per pot, showed that the highest average yield of dry matter was with ammonium sulphate and the next highest with cotton-seed meal, while the highest content of nitrogen in the dry matter was obtained with sodium nitrate and the next highest with ammonium sulphate. The amounts of dry matter of a second crop grown in the same pots without further fertilizer treatment were much less than those of the first crop in all cases, as was also the nitrogen content, except where cotton-seed meal was used. The total recovery of nitrogen was greatest with sodium nitrate and the next highest with ammonium sulphate. These results are taken to indicate that a comparison of sodium nitrate with equivalent amounts of materials not so readily available is not fair if the application is small or moderate and if only one crop is grown.

A comparison of sodium nitrate, alfalfa meal, green rye, dried blood, and cotton-seed meal, when added to buckwheat in sand at the rate of 462 mg. of nitrogen per pot, showed that sodium nitrate gave the highest average yield and dried blood was second. A residual crop of barley was largest on the nitrate pots, but all the recoveries were low.

A comparison of sodium nitrate alone and in combination with vegetable and animal organic matter and with the organic matter alone, when added to buckwheat in sand in amounts equivalent to 616 mg. of nitrogen per pot, showed that the residual effects from the use of sodium nitrate were small if the first crop developed normally, but were considerably increased where an excessive amount of the nitrate depressed the yield of the first crop. The residual effects from the use of organic nitrogenous materials were greater than those from nitrate of soda, but were small when considered from the standpoint of the amount of

nitrogen that apparently remains in the soil after the removal of the first crop. Nitrogen applied in the form of nitrate of soda and organic matter, half the nitrogen from one and half from the other, gave a higher yield of dry matter and a higher recovery of nitrogen than nitrogen which is all in the form of organic matter.

A comparison of sodium nitrate with ammonium sulphate, ammonium nitrate, calcium cyanamid, calcium nitrate, dried blood, green rye, and alfalfa meal, when added to buckwheat in sand in amounts equivalent to 308 mg. per pot showed that the highest average yield was obtained with calcium nitrate and the next highest with ammonium nitrate. The lowest yield was obtained with calcium cyanamid. In general, the percentage of nitrogen in the crop receiving organic materials was lower than in those receiving mineral materials. The highest recovery of nitrogen was with sodium nitrate and the next highest with calcium nitrate.

In pot experiments with buckwheat on a loam soil, using green manures, sodium nitrate, and ground limestone, the purpose of which was to determine the effect of ground limestone on the decomposition of organic matter, it was found that in every instance the average yield of dry matter was higher with ground limestone than without, whether used with green manure alone or with green manure and sodium nitrate. The percentage of nitrogen in the crop was invariably higher where sodium nitrate was used with the green crop, either with or without lime. These results are taken to indicate that the limestone aided the decomposition of the organic matter and increased the availability of the nitrogen.

In a final experiment with barley on a mixture of sand and loam to determine the effect of vegetable matter in the soil on the germination of seed and on the growth of the crop and the effect of ground limestone on the decomposition of vegetable matter, it was found that the ground limestone had a beneficial influence on the decomposition of the organic matter and in making the nitrogen of this available. No effect of the vegetable matter was observed on germination.

The influence of the mechanical composition of the soil on the availability of nitrate of soda and dried blood, J. G. Lipman, A. W. Blair, H. C. McLean, and L. K. Wilkins (*New Jersey Stas. Rpt. 1914, pp. 226–236, pls. 3*).—This is an account of a continuation during 1914 of experiments begun in 1911 (E. S. R., 32, p. 516).

It was found that sodium nitrate and dried blood when used on mixtures of sand and shale soil, varying in proportion from 10 to 90 per cent sand, gave higher yields of dry matter and nitrogen in the first crop than when used with loam soil alone or sand alone. With the first crop sodium nitrate invariably gave higher yields than dried blood. "The average recovery of nitrogen with nitrate of soda for the first crop was 60.52 and with dried blood 43.92 per cent. The highest recovery with nitrate of soda was 71.17 per cent where the mixture contained 70 per cent of sand, and the highest recovery for dried blood was 56.3 per cent with 80 per cent sand. Taking 100 as the availability of the nitrate of soda for this crop, the availability of the dried blood was 72.07. . . . In four out of ten series no nitrate nitrogen was recovered in the second crop, and, with one exception, the recoveries from the other six were low. The average residual recovery from dried blood for all series was 11.05 per cent."

With reference to the total recoveries of nitrogen, the sodium nitrate stood first in all cases, except where sand alone was used. In this respect the dried blood showed an availability of 85.66 when sodium nitrate is taken at 100.

These results are taken to indicate that a marked residual effect can not be expected from a moderate application of sodium nitrate, but that some residual effect may be expected from dried blood in nearly all cases. Mixing sand with

heavy soils was found to permit better aeration and drainage and to result in a more complete utilization of the nitrogen of the soil organic matter.

A comparative study of the effects of equal amounts of nitrogen as dried blood and ammonium sulphate, W. H. McIntire (*Pennsylvania Sta. Rpt. 1912, pp. 75–82*).—Experiments with dried blood and ammonium sulphate, when applied to a silty clay loam soil in amounts equivalent to 24 and 72 lbs. of nitrogen per acre to determine their effect on the nitrifying properties, organic matter content, and the amounts of potassium, calcium, phosphoric acid, and total solids of the soil soluble in distilled water, and to determine any correlation between soil temperature and soil composition as affected by the two treatments, are reported.

The most nitrate was recovered from the soils treated with ammonium sulphate. The largest occurrence of nitrogen as nitrates was found upon the plat with the least content of total nitrogen, while the smallest recovery of nitrates was obtained from the plat having the greatest total nitrogen content. More nitrogen was conserved in the soil when applied as dried blood. The heavier application of ammonium sulphate resulted in the largest recovery of potash, the lesser treatment and the two amounts of dried blood being practically identical. Large amounts of lime were recovered where the sulphate of ammonia was applied. No determinable difference in phosphorus recovery was noted. The ammonium sulphate treatments increased the amounts of total solids recovered in case of both volatile and nonvolatile constituents. No difference was observed in the seasonal moisture content of the soils receiving the smaller amounts of the two forms of nitrogen, but heavier treatments of the sulphate decreased the seasonal moisture content. Both amounts of sulphate of ammonia resulted in less organic matter contents than the corresponding amounts of nitrogen as dried blood. The lighter application of each form of nitrogen seemed conducive to greater conservation of organic matter than the heavier treatments. The light applications of each form were coincident with higher temperatures. The lowest temperature was recorded in the soil receiving the heavy ammonium sulphate treatment, while the light application of this substance gave the highest temperature.

The results of long-continued use of ammonium sulphate upon a residual limestone soil of the Hagerstown series, J. W. White (*Pennsylvania Sta. Rpt. 1913, pp. 55–104, pls, 21*).—Field and laboratory experiments conducted since 1882 on the effect of the use of ammonium sulphate upon a residual limestone soil are reported in detail, the results indicating that the long-continued use of ammonium sulphate has had a pronounced influence upon the reaction of the soil by virtue of its tendency to produce acidity and has exerted an injurious effect as indicated by the decreased yield of hay and, to a less degree, of corn, oats, and wheat.

The soil under consideration showed wide variation in the degree of acidity produced upon areas treated similarly for thirty years, which is attributed to unequal distribution of active lime. The limestone bedrock markedly influenced the composition of the soil where it approached within 2 ft. of the surface. The percentage of lime and magnesia present as carbonates was found to be greater on areas of low acidity. The alkali-soluble humus on areas of high acidity was found to be largely in an uncombined state. The acidity of the soil of one plat receiving 72 lbs. per acre of nitrogen as ammonium sulphate was such as to inhibit the growth of clover except where the underlying limestone approached to within 2 ft. of the surface. "In relation to the quantity of nitrogen applied, the plat receiving 24 lbs. per acre of nitrogen has produced the highest acidity." Nitrification was not entirely checked on the areas showing high acidity. "The low efficiency of sulphate of ammonia as compared with nitrate of soda and dried blood is due primarily to the controlling influence of the accumulated

acidity upon plant growth. . . . The injurious effect of sulphate of ammonia upon the soil . . . can be entirely overcome by the application of sufficient lime, as indicated by pot experiment."

A review of the work of others bearing on the subject and a bibliography of related work are also given. A description and discussion of the analytical methods employed, including a modified Veitch method for determining the lime requirement of soil, are appended.

The influence of lime on the yield of dry matter and percentage of nitrogen, J. G. LIPMAN, A. W. BLAIR, H. C. MCLEAN, and L. K. WILKINS (*New Jersey Stas. Rpt. 1914, pp. 236–238, pl. 1*).—Pot experiments with crimson clover on an acid sandy loam soil containing some gravel, to which ground limestone was added at the rates of 10, 25, 50, and 100 gm., and sodium nitrate at the rate of 2 gm., per 18 lbs. of soil showed that "in all cases where lime was used the average yield of dry matter is at least 10 gm. more than where no lime was used. The difference in yield with 10 gm. and 100 gm. of limestone is not great, the highest yield being with 25 gm. Also the yield is higher with 2 gm. of nitrate of soda than on the check. The percentage of nitrogen is likewise distinctly higher with lime than without."

With a residual crop of soy beans it was found that the yield of dry matter from the limed pots was more than double that from the unlimed pots, while the nitrate of soda pots yielded less than the untreated pots. The percentage of nitrogen in the crop, while not so high as in the preceding crop, was still higher in the limed than in the unlimed pots.

The effect of large applications of ground limestone on the yield and nitrogen content of dry matter, J. G. LIPMAN, A. W. BLAIR, H. C. MCLEAN, and L. K. WILKINS (*New Jersey Stas. Rpt. 1914, pp. 238–240*).—Pot experiments with barley, similar to the above, in which ground limestone was added at the rates of 10, 81.7, 163.4, 408.6, and 817.2 gm., and sodium nitrate at the rate of 2 gm., per from 16 to 18 lbs. of soil showed that "applications of limestone ranging from 1 to 10 per cent gave yields of dry matter which are more than double the yield without limestone and slightly in excess of the yield with nitrate of soda. . . . With applications of limestone the percentage of nitrogen in the dry matter was not so high as with nitrate of soda, but somewhat higher, on the average, than without limestone."

Results of thirty years of liming, W. H. MCINTIRE (*Pennsylvania Sta. Rpt. 1912, pp. 64–75*).—Field experiments with burnt lime with and without manure, ground limestone, and gypsum on a silty clay loam soil are reported, the purpose being to ascertain (1) to what extent and depth applied lime descends into the subsoil, (2) the amount of lime conserved and lost by cropping and leaching, and (3) the effect of lime upon the chemical composition of the soil. The crops grown were corn, oats, wheat, and grass. Burnt lime and ground limestone were applied at the rate of 4,000 lbs. per acre, gypsum at the rate of 320 lbs. per acre, and manure at the rate of 6 tons per acre.

Where lime was applied alone increased crop yields were obtained only with ground limestone. Burnt lime decreased the organic matter of the soil when applied alone and decreased humus accumulation when applied with manure. Calcium sulphate and ground limestone increased the organic matter. Each form of lime increased the nitrogen content of the soil, gypsum, limestone, and burnt lime being effective in the order given. The addition of lime to manure increased crop yields and the nitrogen content of the soil. More lime was removed from the surface in the case of ground limestone and when lime was used with manure than when burnt lime was used alone. Manure induced more thorough dissemination of lime throughout the entire 21 in. of soil, at the same time conserving it.

Gypsum decreased the calcium carbonate content of the soil, but increased the total calcium oxid content. The highest occurrence of inorganic carbon dioxid was due to ground limestone, burnt lime with manure being second, and burnt lime alone third. In general the carbon dioxid content decreased with the depth, as did also the lime content. Approximately 36.8 per cent of the lime applied with manure, 39.7 per cent of the burnt lime applied, and 40.3 per cent of calcium oxid of the limestone treatment were found to exist as carbonates. Approximately 24.3 per cent, 15.9 per cent, and 22.5 per cent of the calcium oxid applied to three different plats occurred in forms other than carbonates.

The magnesium percentage decreased in every instance, the loss being greatest in the first 7 in. and least in the last 7 in. Every case of lime treatment resulted in a decreased total potash content. No correlation between residual lime and residual potash was found. Phosphorus was conserved where lime was applied as burnt lime, both with and without manure. The effect of ground limestone was not so marked upon the phosphorus conservation as was that of burnt lime, while a loss occurred in the plats treated with gypsum.

Field experiments with lime, F. D. Gardner (*Pennsylvania Sta. Rpt. 1913, pp. 22–38*).—Field experiments extending over many years with wheat, oats, corn, clover, and timothy on silty clay loam and residual limestone soils of the Hagerstown series to determine the best form of lime to apply, and in part noted above, are reported in detail. The results indicate that finely pulverized raw limestone is somewhat superior to burned or caustic lime when used in equivalent amounts on these soils.

Experiments to determine the influence of the fineness of subdivision and richness in magnesium carbonate of crushed limestone used for amendment of acid soils, W. Thomas and W. Frear (*Pennsylvania Sta. Rpt. 1913, pp. 206–219, pls. 8*).—Basket experiments with red clover on an acid silty loam soil to determine the influence of the degree of fineness of crushed limestone when used for the correction of acidity are reported. The limestone used was of five degrees of fineness, these being the sizes passing No. 20, 40, 60, 80, and 100 sieves. A sufficient quantity was added to the soil to neutralize its acidity. It is concluded from these experiments that "on silty loams and on soils of heavier texture, on lands where soil acidity is the chief factor limiting clover production, crushed limestone used for amendment should be at least 60-mesh in fineness of pulverization."

Further experiments on the same soil to determine the effect of the magnesium carbonate content of dolomite upon the growth of clover are also reported. Dolomite and calcium and magnesium hydroxids prepared from the carbonates were used. It was found that germination in all the pots that received magnesium mixtures and in those that received dolomite was slower by three to four days than where pure limestone was used, but the final average yields were nearly identical. It is concluded that "in this experiment the presence of magnesia in the amendment did no injury except that indicated by a slight delay in germination, a temporary abnormal coloration of the leaves, and a somewhat diminished root development."

The lime resources of Pennsylvania, W. Frear and E. S. Erb (*Pennsylvania Sta. Rpt. 1912, pp. 272–440, pls. 3, fig. 1*).—This report covers in considerably more detail practically the same ground covered in a previous report (E. S. R., 30, p. 822).

Commercial fertilizers, P. L. Hibbard (*California Sta. Bul. 259 (1915), pp. 51–104*).—This bulletin contains actual and guarantied analyses of 505 samples of fertilizers and fertilizing materials obtained from farmers, purchasers, and agents in California during the year ended June 30, 1915. In 90 samples there

occurred 47 deficiencies in available phosphoric acid, 47 deficiencies in total nitrogen, 12 deficiencies in potash, and 39 incorrect valuations. A list of manufacturers and dealers in commercial fertilizers registered under the California fertilizer law is also given.

Commercial fertilizers in 1914–15, G. S. Fraps (*Texas Sta. Bul. 176 (1915), pp. 3–25*).—This bulletin contains actual and guarantied analyses of 331 samples of fertilizers and fertilizing materials collected since September 1, 1914, in Texas and a list of 504 brands registered for sale in the season of 1914–15, with general notes and explanations. It is stated that only 17,500 tons of fertilizers was sold in the State during the year 1914–15 as compared with 77,400 tons the previous year.

Facts about fertilizers licensed for sale in Wisconsin: Reports of analyses for 1914, W. H. Strowd (*Wisconsin Sta. Bul. 255 (1915), pp. 3–13, fig. 1*).—This bulletin gives general information regarding the purchase and use of commercial fertilizers, and reports actual and guarantied analyses and valuations of 41 samples of fertilizers and fertilizing materials licensed for sale in Wisconsin during 1914 and of 11 samples of ground limestone and miscellaneous unlicensed fertilizers.

AGRICULTURAL BOTANY.

A study of the influence of pod position upon viability and vigor of seedlings, B. D. Halsted et al. (*New Jersey Stas. Rpt. 1914, pp. 317–321*).—A progress report is given of investigations on the influence of position in the pod of seeds of soy beans, cowpeas, pea beans, Lima beans, and of corn grains on the cob, as shown by the viability and vigor of their seedlings.

With soy beans in general the middle seeds were found to be most vigorous, with those at the base of the pod the poorest, and the tip ones next in value for planting. With pea beans and cowpeas similar results were obtained. In Lima beans the lightest seed are those formed at the base of the pod, size and weight increasing toward the tip. No relation between weight of Lima bean seed and viability and vigor has been established. In corn the experiments showed the superiority of seed from the middle of the ear, followed by the basal and tip seeds in the order named.

Abortiveness of ovules in connection with position in pod, B. D. Halsted et al. (*New Jersey Stas. Rpt. 1914, pp. 321–329*).—Studies are reported on the relation of abortiveness of ovules to viability and vigor of seeds and seedlings in Canada peas, soy beans, Lima beans, and wistaria, and also notes are given on abortiveness associated with position on the plant, the relation of prolificness to heredity, size of fruit as related to position on the plant, and studies of hypocotyl elongation.

In beans, in connection with the studies of abortiveness of ovules, there is considered to be evidence of a direct connection between the percentage of abortiveness and the vigor of the plants produced from the same position in the pod.

In the hypocotyl elongation studies, it was found that the hypocotyls of beans are much longer in the field than in the greenhouse, while just the opposite result was observed for the first internodes; that is, the seedlings with the longest hypocotyls showed the shortest internodes. For length above the first internode, field and greenhouse measurements were found to be parallel.

The comparative morphology of the embryo and seedling in the Gramineæ, Ethel Sargant and Agnes Arber (*Ann. Bot. [London], 29 (1915), No. 114, pp. 161–222, pls. 2, figs. 35*).—Giving an account of the comparative anatomy

of grass seedlings as typified by Avena, Zea, and Triticum, and the anatomy of certain other monocotyledonous seedlings as compared with that of the grasses, the authors hold that the key to the morphology of the grass embryo lies in the morphology of its seedling as interpreted by comparison with seedlings of the other monocotyledons. A list is given of the principal papers which have appeared since 1872 relating to the embryo and seedling of the Gramineæ.

A method of obtaining complete germination of seeds in Œnothera and of recording the residue of sterile seed-like structures, B. M. Davis (*Proc. Nat. Acad. Sci., 1 (1915), No. 6, pp. 360–363*).—Reporting results of tests with about 50 species, races, or hybrids of Œnothera, the author claims that genetical research must adopt methods of securing rapid and complete germination of the viable seeds and conservation of the remainder in a way suitable for convenient observation, if serious vitiation of results is to be avoided. The method employed by the author is described, with its advantages, and methods of hastening germination of Œnothera are also discussed, with practical adaptations.

Investigations in the field of the physiology of nutrition of higher plants by the methods of isolated nutrition and sterile cultures, I. Shulov (*Izslîedovaniîa v oblasti fiziologii pitaniîa v'isshikh rasteniĭ pri pomoshchi metodov izolirovannago pitaniîa i steril'n'ikh kul'tur. Moscow, 1913, pp. 213, figs. 20; rev. in Zhur. Opytn. Agron. (Russ. Jour. Expt. Landw.), 15 (1914), No. 1, p. 65*).—In this book are collected the results of experiments carried out during the years 1900–1912.

Ammonium sulphate is deemed injurious to the plants, not primarily as such, but by its strong physiological acidity. The application of the method of isolated nutrition has fully demonstrated the possibility of nourishing plants by furnishing separate parts of the root system with portions of the nutritive mixture.

The rôle and function of mineral salts in plant life, D. M. Rabinovitch (*[Trav.] Inst. Bot. Univ. Genève, 8. ser., No. 11 (1914), pp. 24, figs. 9*).—The author reports a study on the assimilation of nutritive mineral materials by *Raphanus sativus*, also on the influence of calcium carbonate and magnesium carbonate on the development of *Digitalis purpurea*. The results as shown by analysis after stated periods are presented in tabular and graphical form as regards *R. sativus*.

The tests with *D. purpurea* show increasingly injurious results corresponding to an increase of calcium carbonate or of a mixture in equal proportions of this salt with magnesium carbonate, but the increase of injury was much less marked when dolomite was substituted for the mixture. The toxic effect seems to be correlated with the degree of alkalinity.

Contribution to the study of circulation, B. H. A. Groth (*New Jersey Stas. Rpt. 1914, pp. 331–334, pl. 1, fig. 1*).—Studies are reported on the circulation of sweet potato in which it appears that the sweet potato has difficulty in storing starch in submerged soil, but there is little difficulty in doing so in air-dry soil if any portion of the stem has access to water. The sweet potato seems able to form aerial roots if the soil in which it grows is covered by stagnant water, and it may store starch in its stem if the roots are prevented from growing properly.

Winter rest in twigs of witches' brooms, H. C. Schellenberg (*Ber. Deut. Bot. Gesell., 33 (1915), No. 2, pp. 118–126*).—It was found that witches' brooms in winter usually responded more quickly than normal parts of the same tree to temperature and moisture conditions suitable to bud development, but that this priority of response decreased as spring approached. It is believed that no inherent tendency to rest is present in witches' brooms, but that normal condi-

tions may renew growth at any time during the period of rest, which is really enforced.

Oxidation in healthy and diseased apple bark, D. H. Rose (*Bot. Gaz., 60* (*1915*), *No. 1, pp. 55–65*).—An account is given of an investigation made regarding oxidase activity in the bark of apple trees, all the tests employing Bunzel's simplified oxidase apparatus (E. S. R., 32, p. 508).

It is stated that extract of apple-tree bark affected with Illinois canker, due to *Nummularia discreta*, causes greater and more rapid oxidation of pyrogallol than does the extract of healthy bark. Diseased bark extract is less acid than that of healthy bark, apparently justifying the conclusion that within the range of concentrations here employed, oxidation is in approximately inverse ratio to the acidity of the extract.

Oxidases are very sensitive to small variations in the acidity of the solution in the oxidase apparatus.

The hypothesis is offered that the gradual slowing down of oxidation in this apparatus is brought about by accumulation of oxidation products, probably acetic and oxalic acids, and not by using up of the oxidase through chemical combination of oxidase and oxidizable substance.

Parthenogenesis, parthenocarpy, and phenospermy in Nicotiana, T. H. Goodspeed (*Univ. Cal. Pubs., Bot., 5* (*1915*), *No. 8, pp. 249–272, pl. 1*).—This gives a fuller account of the work previously noted (E. S. R., 33, p. 435).

In the majority of these parthenocarpic fruits empty seeds were produced in large numbers. These were mostly smaller than the self-fertilized seed of the same plant. For this type of seed production, with or without pollination, the term phenospermy is suggested as synonymous with "empty" or "abortive."

A few of the seed from the parthenocarpic fruits were neither parthenogenetic nor phenospermic, containing traces of endosperm only.

The biology of Melampsora lini, A. Buchheim (*Ber. Deut. Bot. Gesell., 33* (*1915*), *No. 2, pp. 73–75*).—Reporting tests with uredospores of *M. lini* on several species of Linum, the author states that so far as reliable results have been obtained this fungus shows a high degree of specialization.

Some filamentous fungi tested for cellulose destroying power, F. M. Scales (*Bot. Gaz., 60* (*1915*), *No. 2, pp. 149–153*).—It is stated that in a study previously noted (E. S. R., 28, p. 627), several cellulose destroying filamentous fungi were identified, and two new species were found. One of the latter is said to produce a very active cytase. The present report gives results of an attempt to determine more species capable of exercising this function.

The cellulose-destroying power of about 30 species of Penicillium and 10 species of Aspergillus was determined with two different nitrogen sources, an ammonium sulphate cellulose agar and a peptone cellulose agar being employed for this purpose. The results as tabulated are positive in all but eight cases for the medium containing the ammonium salt, and the appearance of negative results for the peptone alone in some of the other cases is discussed.

The reaction of bacteriologic culture media, W. M. Clark (*Jour. Infect. Diseases, 17* (*1915*), *No. 1, pp. 109–136, figs. 7*).—This deals with the application of the principles of hydrogen ion concentration in culture media as related to the titration method.

The differentiation of bacteria of the colon-aerogenes family by the use of indicators, W. M. Clark and H. A. Lubs (*Jour. Infect. Diseases, 17* (*1915*), *No. 1, pp. 160–173, figs. 2*).—It is claimed that by these studies, as described, a simple diagnostic test has been established, the results of which correlate perfectly with the gas ratios of the two main groups of the colon-aerogenes bacteria.

FIELD CROPS.

Report of the department of farm crops, I. L. Owen and W. C. Boughner (*New Jersey Stas. Rpt. 1914, pp. 201–206*).—In this report data are given on the cost items in the production of various farm crops for 1914.

The average costs and yields were, respectively, as follows: In a 10-acre field of timothy $18.34 per acre, $5.32 per ton, and 3.45 tons per acre; in a 14.5-acre field of mixed hay $9.34 per acre, $3.87 per ton, and 2.4 tons per acre; in a 9-acre field of alfalfa $16.61 per acre, $4.45 per ton, and 3.73 tons per acre; in a 27-acre field of alfalfa $12.25 per acre, $3.69 per ton, and 3.32 tons per acre; in a 16-acre field of oats and peas $14.95 per acre, $9.96 per ton, and 1.5 tons per acre; in a 6-acre field of rye followed by soy beans $13.22 per acre of rye straw, 1.95 tons per acre, and $16.24 per acre of soy beans and 11 bu. of seed per acre; in a 24-acre field of silage corn $29.74 per acre, $3.49 per ton, 8.5 tons per acre; in a 6-acre field of silage corn $19.79 per acre, $3.96 per ton, and 5 tons per acre; and in a 6-acre field of ear corn $23.81 per acre, 60 bu. of grain and 1 ton of stover per acre.

Cereal investigations on the Belle Fourche experiment farm, C. Salmon (*U. S. Dept. Agr. Bul. 297 (1915), pp. 41, figs. 12*).—This bulletin continues the report of work with cereals on the Pierre clay soil at the farm at Newell, S. Dak., previously noted in part (E. S. R., 23, p. 335; 25, p. 640).

Experimental conditions regarding soil and climate and the methods employed are described and discussed. Results are given and discussed of experiments with each cereal, namely, wheat, oats, barley, rye, emmer, and flax for the experimentation period, 1908 to 1913, inclusive. The results are believed to be applicable to western South Dakota, northeastern Wyoming, and southeastern Montana.

"On the average, satisfactory yields were obtained from winter wheat and fairly good yields from spring wheat. . . . The best average yields of spring wheat have been obtained from the durum varieties, Kubanka and Arnautka. Of the spring common wheats, the best variety to grow appears to be the Power Fife. The best rate of seeding for durum wheat is from 4 to 5 pk. to the acre and for spring common wheat from 3 to 4 pk. The best varieties of winter wheat for western South Dakota are the Kharkof, Turkey, and Crimean. These are very similar varieties, which differ only slightly in value. Experiments to determine the best date of seeding for winter wheat have failed to show any definite results. In general, the date of seeding must be determined by the seasonal conditions. Medium early seeding is to be preferred if there is sufficient moisture to insure germination. It is much better to grow winter wheat than spring wheat in the Belle Fourche section. The average yield of Kharkof winter wheat for the six years was 21.2 bu., of the best durum 11.8 bu., and of the best spring common 11.1 bu.

"The best average yields of oats for the six years were obtained from the Sixty-Day and Kherson varieties. The returns from this crop were much lower than from winter wheat and slightly lower than from spring wheat. The best rate of seeding for small-kerneled early varieties of oats, such as the Sixty-Day and Kherson, is about 6 pk. to the acre.

"The returns from barley were even less satisfactory than those from oats. The best average yield for the six years was only 10.7 bu., and for the five years from 1909 to 1913, only 9.7 bu. The most satisfactory varieties are those which mature early, such as the 6-rowed varieties, Gatami and Odessa, and the 2-rowed variety, White Smyrna.

"The yields obtained from winter rye and from winter and spring emmer have been much lower than those from the other cereals. These crops can not now be recommended for western South Dakota. The best yield from flax in a 2-year test was obtained from the Select Russian variety. It is probable that the best results will be obtained if this crop is sown as early as good germination and growth may be expected."

The continuous growing of wheat and rye, 1914, J. G. LIPMAN ET AL. (*New Jersey Stas. Rpt. 1914, pp. 222, 223, pl. 1*).—This report continues work previously noted (E. S. R., 32, p. 533).

The results of 1914 were similar to those of last year in that the yields of rye and wheat were greatly increased by the use of the legumes in the rotation. The amount of nitrogen recovered on these plats was also greater than on those on which no legumes were used. In the case of the wheat the nitrogen recovered was more than doubled.

Green manuring and cover crops, W. P. BROOKS (*Massachusetts Sta. Circ. 55 (1915), pp. 6*).—A revision of Circular 37 (E. S. R., 32, p. 332).

Winter crops, C. K. MCCLELLAND (*Georgia Sta. Bul. 117 (1915), pp. 329–352, figs. 5*).—This bulletin gives data as to methods of production of wheat, oats, rye, barley, spelt, vetch, bur clover and crimson clover, and briefly discusses the value of winter crops for rotation, for preventing soil leaching and washing, for winter pasture, for green manure, as nitrogen gatherers, and for hay and grain. Variety tests of wheat, oats, rye, and barley; cultural tests with rye, spelt, and vetch with cereals; and inoculation tests with crimson clover are reported.

Filling silos, J. B. FITCH (*Kansas Sta. Circ. 53 (1915), pp. 8, figs. 3*).—The subjects discussed in this circular include the condition of the crop for filling the silo, methods of filling, adding water, packing, gas in the silo, and sealing the silo.

Alfalfa in Delaware, A. E. GRANTHAM (*Delaware Sta. Bul. 110 (1915), pp. 3–42, figs. 12*).—This bulletin briefly discusses methods of production and the value of the crop for various purposes, suggests suitable rotations, and gives results of fertilizer experiments with alfalfa.

The data show that higher yields of hay followed the use of 2,000 lbs. of burnt lime per acre than of either 1,000 or 4,000 lbs., and that when acid phosphate was used singly or in combination with other fertilizers the increase from the use of lime was not so great as where phosphoric acid was not applied. "The plats receiving nitrogen alone and nitrogen and potash were a trifle less favorably located, and while the stand of alfalfa was good, the yield is perhaps a little less than it should be. Thus nitrogen alone produced a little less than the uninoculated check; nitrogen and potash without lime yielded about the same as the check. The low yields from these plats might be considered in error if it were not for the poor showing nitrogen and potash made in other combinations. Where nitrogen was used in connection with phosphoric acid and potash and not limed, the gain due nitrogen was zero. Where the above combinations were used with lime, the gain due nitrogen was but 40 lbs. Where nitrogen was used with phosphoric acid and unlimed, as against phosphoric acid alone, the gain due nitrogen was but 130 lbs. Potash behaves similarly to nitrogen, although the gain is more than from nitrogen. Where potash is used with nitrogen combined, as compared with nitrogen alone, the gain due potash is only 120 lbs. The combination of phosphoric acid and potash unlimed, as compared with phosphoric acid alone, gives an increase of 400 lbs. due to potash. Where nitrogen, phosphoric acid, and potash were used together and unlimed, as compared with nitrogen and phosphoric acid, the gain due potash is 270 lbs. If lime is added to both of the above combinations, the increase from potash is 560 lbs.

"Phosphoric acid and lime seem to be most effective in increasing the yield. . . . In the combination of nitrogen and phosphoric acid, unlimed, phosphoric acid gives a gain of 1,930 lbs. over nitrogen alone. With nitrogen and potash, phosphoric acid, unlimed, gives an increase of 2,080 lbs. over nitrogen and potash alone; when lime is added to both of the above combinations the increase due to phosphoric acid is 1,000 lbs.

"Lime shows a marked effect in every case, except . . . when phosphoric acid and manure were used. Phosphoric acid used with and without lime gave a difference in favor of lime of 380 lbs. per acre. Where lime was used with nitrogen as against nitrogen alone the gain due lime was 1,920 lbs. The effect of phosphoric acid is seen in the combination of nitrogen and phosphoric acid as against this with lime. Here the lime made an increase of only 350 lbs. per acre. Nitrogen and potash combined, with and without lime, gave an increase of 1,720 lbs. due to lime. Where nitrogen and phosphoric acid were combined as against nitrogen, phosphoric acid, and lime the latter combination gave an increase of only 600 lbs. On the plat where all three elements were combined with and without lime the lime made an increase in yield of 640 lbs.

"Where manure was applied lime made a very small increase in yield of hay per acre. In combination with 5 tons of manure lime made an increase of 140 lbs. per acre; with 10 tons of manure 280 lbs. increase was made. The reason for lime failing to show much effect is probably due to the fact that manure is often alkaline in reaction, thus supplanting the lime in sweetening the soil, or, if the soil lacks sufficient lime as direct plant food for the alfalfa, the soluble lime in the manure may take the place of the applied lime, thus accounting for the poor showing of the commercial lime.

"Inoculation gave an increase in the yield of hay of 1,360 lbs. over no treatment."

The results of cooperative experiments with farmers throughout the State were similar to those secured in the station fields.

Alfalfa, C. K. McClelland (*Georgia Sta. Circ. 72 (1915), pp. 4, figs. 2*).—This gives methods of production for Georgia conditions on the basis of the station's work.

Bur clover, C. V. Piper and R. McKee (*U. S. Dept. Agr., Farmers' Bul. 693 (1915), pp. 14, figs. 7*).—This publication gives the cultural requirements of the bur clovers, discusses the value of bur clover as a pasture crop, cover and green manure crop, and hay crop and in rotations, and notes some seed characteristics of several varieties. Analyses of the plant are given showing its great similarity to alfalfa.

Experiments with corn, C. F. Noll (*Pennsylvania Sta. Rpt. 1912, pp. 33–48*).—This reports yields in variety tests of corn for grain, stover, and silage covering the period from 1908 to 1911. Results of storing seed corn in a warm room or a cold shed showed an increased yield of 4.2 bu. per acre from the warm storage seed, the average of two years.

Seed corn condition in Pennsylvania, spring of 1912, F. D. Gardner (*Pennsylvania Sta. Rpt. 1912, pp. 29–33*).—This reports the results of germination tests of seed corn of the 1911 crop requested by farmers from all sections of the State. A general average showed a germination of only 80.5 per cent. Of the 126 samples received, 30 tested from 95 to 100 per cent.

The feeding of cotton, II, H. C. White (*Georgia Sta. Bul. 114 (1915), pp. 257–268*).—This bulletin reports the continuation of work previously noted (E. S. R., 31, p. 433), and consists chiefly of data showing for the crops of 1911 and 1912 the analysis of cotton at four stages of development, namely, to the first form, the first bloom, the first open boll, and maturity. The cotton plants

were grown under various fertilizer treatments and compared with a standard fertilizer consisting of 468 lbs. of acid phosphate, 36 lbs. of muriate of potash, and 130 lbs. of nitrate of soda per acre.

"The obvious indications of these results, as compared with those yielded by application of the standard fertilizer, are that substantial diminution in amount of either of the principal ingredients of the plant's food, phosphorus, calcium, potassium, or nitrogen, involve (1) substantial reduction in the weight (dry matter) of the plant in its entirety and in the several periods of growth, particularly after setting of the form, and (2) the increase in time period from form to bloom, from bloom to open boll, and in the maturing of the plant. The proportion of ash to dry matter at any stage of growth or relative amounts of nitrogen and mineral ingredients do not appear to be seriously affected by the amount of the food supply. This would seem to indicate the important fact of the absence of a power in the plant to store food in any particular period of growth beyond the needs of the plant for the period."

A study of the effect of various fertilizers on the fat content of the seed produced in these experiments showed that "the season affected notably the weight of the seed and the fat content; a similar effect is noted in the total weights of dry matter produced. The fertilizer seems, however, to affect the relative fat content. Assuming the product from the standard fertilizer to be 'normal,' it appears that lack of phosphorus diminishes notably the storage of fat and of potassium and nitrogen to some but a lesser degree."

The field pea as a forage crop, H. N. VINALL (*U. S. Dept. Agr., Farmers' Bul. 690 (1915), pp. 23, figs. 16*).—This publication describes several varieties of field peas, discusses methods of cultivation and harvest, and notes their value as a forage crop, alone and in mixture with cereals, as grain, hay, silage, and green manure and cover crops, and in rotations. Brief notes are given on diseases and insect enemies.

Factors influencing the protein content of soy beans, J. G. LIPMAN, A. W. BLAIR, H. C. MCLEAN, and L. K. WILKINS (*New Jersey Stas. Rpt. 1914, pp. 240–245*).—To study the influence of the thickness of planting on the protein content of soy beans, 2, 5, 8, 12, and 20 plants were grown per pot in pots of sand and of soil. "In both cases the yield of dry matter increased with the increase in planting, and the increase is much more rapid with sand than with soil. The average yield for the 3 pots with 2 plants in soil is 43.85 gm. and for 20 plants is 65.8 gm. The average yield for the 3 pots with 2 plants in sand is 4.83 gm. and for 20 plants it is 33.67 gm. With soil the percentage of nitrogen in all cases is above 3 per cent, the average being close to 3.5, with a slight tendency to a higher percentage with the thinner plantings. With sand the plantings from 8 to 20 give slightly higher percentages than those from 2 to 5. Here the lowest yield and lowest average percentage of nitrogen is with 2 plants per pot."

In studying the influence of the date of harvest, plants were grown in pots of soil and harvested 6, 8, 10, 12, 15, and 18 weeks from the date of planting. "From these results it is quite evident that if the beans are to be harvested as forage, harvesting from the end of the tenth to the fifteenth week will result in giving the maximum protein content. Earlier than the tenth week they have not sufficiently matured to give the maximum percentage of nitrogen, and after the fifteenth week the loss of the leaves may result in a lower percentage since the leaves are richer in nitrogen than the stems."

In studying the effect of different fertilizers, pots of soil fertilized with nitrate of soda, calcium carbonate, acid phosphate, and calcium sulphate were planted to soy beans. The plants were harvested at maturity. Analysis showed the percentage of nitrogen to be fairly constant and in no case to fall below 3

per cent. "The maximum from a single pot is 3.45 where 4 gm. nitrate of soda was applied; the maximum average, 3.348, occurs where 10 gm. calcium carbonate was used, and the average with 25 gm. is only slightly less. The lowest average, 3.126, is found with 4 gm. calcium sulphate. These pots, however, gave the highest yield of dry matter, thus placing the yield of total nitrogen in second place, the highest occurring with 4 gm. nitrate of soda. It is of especial interest to note that the limestone gives higher percentages of nitrogen, on an average, than the nitrate of soda, thus emphasizing the value of an abundant supply of limestone in the accumulation of atmospheric nitrogen, and also making it clear that it is not necessary to add nitrogenous fertilizers in the growing of soy beans, provided the soil is well supplied with lime."

Analysis of 11 varieties of soy beans harvested at about the same stage of maturity as forage shows that "there is a rather wide variation in the percentage of nitrogen in the different varieties. The Medium Yellow, Ebony, and Guelph show above 3.25 per cent of nitrogen; the Edna and Manhattan show an average of more than 3 per cent. The Ohio 9035 and Swan show an average of more than 2.75 per cent, the Claude and Wilson more than 2.5 per cent, and the Tarheel shows an average of more than 2.25 per cent. It should be observed that in most cases the percentage of nitrogen in a particular variety runs quite constant. It is of interest to note that the Tarheel, which gives the highest yield of dry matter, shows the lowest percentage of nitrogen. Since this variety does not mature well in this latitude it would not be well adapted for growth if seed were desired. If, however, it were to be used as a forage or green manure crop, its rank growth would probably result in adding to the soil more nitrogen than would be added by some of the smaller varieties. Certainly this was true in this case, for there was recovered in the crop 3.01 gm. [per pot] as against 2.56 gm. for the Swan, which was the next highest. The [Hollybrook], with a recovery of 2.45 gm., stands third. The Ebony and Manhattan both produced small plants, and have this much against them if one is considering the enrichment of the soil. The Tarheel, Swan, Hollybrook, and Ohio 9035 all show a recovery of nitrogen in the crop of above 2 gm."

Tobacco investigations, E. K. Hibshman (*Pennsylvania Sta. Rpt. 1912, pp. 455–479, pls. 15, figs. 5*).—In this report are given notes and data secured in the selection and breeding of Pennsylvania Broadleaf tobacco during 1909, 1910, and 1911 in an effort to improve and purify the type that was being planted in Lancaster County. Data show the number, length, and width of leaves, the number and size of suckers, and the yield of leaf per plant.

Experiments in high and low topping and normal (28 by 42 in.) and close (28 by 36 in.) planting of tobacco showed in 1910 and 1911 that "with the same planting distances high topping produces more weight per acre than low topping. Furthermore, they also indicate that close planting when accompanied by high topping produces more weight than normal planting with high topping. It was observed that the leaf on the closely planted and high topped plats was not as heavy in body nor as uniform in color as that from the normal planted plats topped high. It was also far more difficult to sucker the closely planted plats without breaking leaves. The high topped plats were of course slow to ripen; and apparently the closely planted and low topped plats ripened later than those normally planted and low topped.

"It is not safe to conclude, however, from these experiments that tobacco should always be topped high. The best height of topping depends upon a number of factors. The grower must first take into consideration the number of leaves a plant would naturally develop if allowed to go to seed. He must also consider the time of the season when the plant is ready to be topped; if it is early, he can top high; if it is late, he must top low in order that the plant may

ripen before frost. The amount of available plant food in the soil and the conditions of the weather must also be considered. It is therefore impossible to set any fixed rule for height of topping tobacco, and the grower must depend upon his own judgment.

"We can, however, safely draw these conclusions from these experiments: Under favorable conditions of soil fertility, weather, and time for topping, and with a reasonably good strain of tobacco, it is advisable to top high when the question of weight per acre is the chief controlling factor. We must, however, bear in mind that by increasing the number of leaves on a plant we decrease the amount of sunshine that can reach the lower leaves, which means that we shall obtain a leaf thinner in body and also that we shall decrease the relative size of the leaves. Also, by closer planting, we may increase the weight, but we produce a leaf slightly thinner in body and not so uniform in color. By closer planting we also increase the difficulty of cultivation and suckering. The foregoing remarks are based, it is to be remembered, upon experiments with plants of exceptionally erect habit at the time of topping."

Notes from a reconnoissance survey on the tobacco industry in Clinton County are also given.

Tobacco experiments, W. Frear, E. K. Hibshman, O. Olson, and H. R. Kraybill (*Pennsylvania Sta. Rpt. 1913, pp. 171–200, pls. 37*).—This reports tobacco experiments conducted by the station in cooperation with the Lancaster and Clinton counties' tobacco growers' societies and the U. S. Department of Agriculture, and continuing work noted above.

These experiments include work to determine the yield values of selected filler strains of Broadleaf tobacco, yield of different filler varieties, yield and quality of binder and wrapper tobacco varieties, influence of different conditions of topping and planting upon filler tobacco yields, influence of topping tobacco plants upon their later development, influence of suckering upon the development of the tobacco plant, influence of additions of mineral fertilizers to barnyard manure upon the yield of filler tobacco, and studies to determine the effect of steam sterilization of tobacco seed beds. Data show score card values of varieties of filler tobacco.

Data from the Lancaster County tests show that low topping resulted in a lower yield, and that with high topping there was little difference between normal (28 by 42 in.) and close (28 by 36 in.) plantings.

Data from a study of the influence of the time of topping upon the distance between the leaves on the stalk "indicate that the total length of stem continues to increase in the untopped plant, at least until the middle leaves are ripe. The distribution of this growth among the internodes is not determined by these measurements, but the total rate decreases rapidly. Topping does not instantly arrest the stem elongation but greatly decreases its rate. Most plants show no growth in the stem length after being topped when the first flower is half developed. There is a distinct increase in the leaf interval between the time of appearance of the first bud and that when the first flower is just in bloom. This increase from August 19 to 26 amounted, in the plants and growth indications here observed, to an average of 0.13 of an inch between adjacent leaves. This increase may have affected the upper internodes alone. The practical importance of the difference may be judged from the average internode lengths at the dates mentioned (14 internodes being here concerned), namely, August 19, 1.16 in.; August, 29, 1.59."

The usual method of suckering showed a plat yield of 1,785 lbs. of stripped leaf as against 1,230 lbs. from a plat not suckered. An increase in yield of 129 lbs. of cured leaf per acre is noted as the result of the addition of 10 tons of

well rotted horse manure to 900 lbs. of 14 per cent dissolved phosphate rock and 200 lbs. of sulphate of potash.

"Parallel beds, covered respectively with glass and muslin, were otherwise treated alike. Under glass, the seed germinated one day the earlier, but after six weeks the muslin covered plants were slightly the larger."

A test of varieties of wheat, C. F. Noll (*Pennsylvania Sta. Rpt. 1913, pp. 47–55*).—This article is essentially the same as Bulletin 125 already noted (E. S. R., 30, p. 342).

Report of seed examination, C. F. Noll (*Pennsylvania Sta. Rpt. 1912, pp. 49–56*).—This report deals with the analyses and germination tests made from January, 1909, to June 1, 1912, particularly with red clover, alsike clover, timothy, and alfalfa seed. The average purity and germination percentages for the four years are given as 97.1 and 89.7, respectively, for red clover, 95 and 86.6 for alsike clover, 98.3 and 92.5 for timothy, and 95.2 and 87.9 for alfalfa.

State seed inspection and weed control, 1914, A. L. Stone (*Wisconsin Sta. Bul. 254 (1915), pp. 3–39, figs. 28*).—This bulletin discusses the method of weed control as carried out in Wisconsin and notes the great benefit derived from its enforcement. Results of analyses of 376 samples of seed are given, with descriptions and illustrations of 25 kinds of weed seeds. A synopsis of the state seed law is included.

HORTICULTURE.

[Report of horticultural investigations], M. A. Blake and C. H. Connors (*New Jersey Stas. Rpt. 1914, pp. 40–75, 81–84, pls. 14*).—The work was continued along much the same lines as reported for 1913 (E. S. R., 32, p. 534). An article by C. H. Connors discusses some abnormal forms of plant growth, including phyllody of the corolla in the dahlia, Lucretia dewberry, and the spotted calla; double flowers in the tomato; petalody of the sepal in roses; the rate of growth of roses as indicated in the form of the leaves; malformed rosebuds; and malformation of buds due to cyanid fumigation.

In June, 1909, an experiment with My Maryland roses was undertaken to study the effect of different amounts of potash upon roses. The soil used was a normally prepared greenhouse soil and each plat contained 15 sq. ft. of bench surface and was set with 15 plants. The different potash treatments were as follows: No potash, 1 gm. of high-grade sulphate of potash weekly, 2 gm. weekly, and 5 gm. weekly. Each plat also received 272 gm. ground limestone, 204 gm. acid phosphate, 54 gm. bone meal, and 50 gm. of dried blood mixed with the soil before the plants were benched. Concentrated tankage at the rate of 27 gm. per month was applied to each plat after the plants were established. Thirteen crops of roses were cut from these plats from June, 1909, to November, 1912. The plat receiving 2 gm. of potash weekly produced during this time 47 more flowers than the plat receiving 5 gm. of potash weekly. Taking the grades of flowers into consideration, the 5-gm. plat did as well as the 2-gm. plat. There was very little difference between the check plat and the 1-gm. plat, the latter excelling the check plat by 11 flowers in the fancy grade. The results as a whole apparently indicate that for the first two years a good red shale loam with 20 per cent of composted cow manure contains sufficient potash to supply the needs of My Maryland roses. The experiment also indicates that relatively large amounts of potash in the form of high-grade sulphate may be applied to roses without any danger of injury in the presence of sufficient quantity of lime. Large quantities of potash did not appear to increase the color or the general quality of the flowers. To make certain that sufficient amounts of potash are present in soils used for more than one season for forcing roses, it is suggested

that florists might apply 3 lbs. of high-grade sulphate of potash to 600 sq. ft. of soil, 4 in. deep, the soil being composed of a good loam composted with 20 per cent of cow manure.

In a soil study conducted with My Maryland roses, red shale or Penn loam soil was collected in the form of sod in the fall of 1908 and allowed to decompose. In the following spring portions of the soil were mixed with 10, 20, and 30 per cent of sand, respectively. Roses were grown in the different soil mixtures, similar fertilizer treatment being given to each bench plat. The experiment which was conducted for a period of more than three years shows that My Maryland rose apparently succeeds equally as well upon a soil containing a large proportion of sand as upon a heavy clay loam. It is possible to maintain rose plants in a vigorous and profitable condition upon the same soil for at least three seasons without resorting to the use of animal manures. The heavy or stiff soils appear to suffer first from lack of organic matter. The inference is drawn that the addition of sufficient organic matter to maintain the water-holding capacity of the soil may be of more importance than the heaviness or lightness of the soil.

Notes are given on the general condition of the fruit crop in the State in 1914, together with some observations upon variations in form and length of apple stems between varieties and within the same variety. A report based on inquiries sent to fruit growers is also given showing the relative commercial merits of the various varieties of fruits grown in the State.

Attention is called to the injury to rapidly growing peach trees caused by poultry through breaking down the tips of the branches. The experience of the college farm indicates that where peaches are grown in connection with poultry, some means must be taken to prevent the poultry from roosting in the trees.

Viability tests of peach pollen similar to those made by C. Miller in the previous year (E. S. R., 32, p. 534) were conducted by H. F. Huber. A number of solutions were tested as culture media. As a result of this test a solution containing 15 per cent saccharose and 1.5 per cent gelatin proved to be the best and was selected for the investigation. When this solution was acidulated with a few drops of H_2SO_4 pollen germination was much less than when a nonacidulated solution was used. Data secured from the germination test indicate a variation in viability of peach pollen from different blossoms from the same tree. The results indicate a variation in pollen viability between large and small flower buds on the same tree. At the same time small buds growing on quite vigorous twigs germinated better than normal-sized buds growing on weak twigs. The work as a whole has shown that pollen of good vitality can be obtained from peach buds forced into bloom a month or two in advance of the normal season of bloom.

A statement is given relative to the general condition of the Vineland experimental peach orchards, including a discussion of the occurrence of peach leaf curl, together with observations on the nature of June drop of peaches. An account, including cost data and results, is given of cooperative peach shipments from the Vineland district to Boston during the season of 1914.

Comparative data are given showing the blooming dates of tree fruits at the college farm for the years 1912, 1913, and 1914, together with blooming dates of ornamental trees and shrubs in 1914, and meteorological data for the year ended October 31, 1914.

[Report of heredity investigations], B. D. HALSTED ET AL. (*New Jersey Stas. Rpt. 1914, pp. 295–317, pls. 9*).—Inheritance studies of various crosses of sweet, pop, and flint varieties of corn and of peppers (E. S. R., 32, p. 536) were continued in 1914.

Records are given of character transmission in a number of F_1 plats of corn. One block of a cross between Gold Nugget and Black Mexican, representing a flinty-sugary corn, was grown with reciprocals in alternate rows. Notes taken during the season showed no differences in size and vigor of plants, time of blooming, etc., between the direct and reciprocal crosses.

With the view of starting a study relative to the possible effect upon future plants of limiting the number of grains on seed ears, a supply of seed corn was secured from ears on which the development of most of the grains had been prevented by covering up the silk tips with paper bags after they had been exposed for only one day, the bags remaining on the ears until the silk became dry. A viability test was made of corns of various textures and their crosses. The average percentages of viability for the different corns were as follows: Dents, 88.9; pops, 88.4; waxy, 85.5; floury, 84.1; flinty, 81.1; and sugary, 70.3. The viability test was conducted with 25,600 grains divided equally between the starchy and sugary types and from the same set of ears bearing the crossed grains in their second generation. The percentage of viability for the starchy grains was 92.6 as compared with 78.3 for the sugary grains. The results indicate that sweet corn is a comparatively weak type. Tests in sprouting the seed under unfavorable conditions show that the starchy grains are much more superior to the sugary grains than the above noted results. Observations on the further growth of the seedlings show that the primary feebleness affects the whole life of the plant to some extent. There was a much greater variability in length of the mesocotyl among seedlings of sugary grains than among those of starchy grains. This variability is greatest when the grains are placed 1 in. below the surface of the soil and least when planted 3 in. deep.

A large number of varieties and crosses of corn were tested as to the removal of a portion of the endosperm before planting. The starchy grains did not show any marked reduction in viability, whereas viability among the sweet grains was considerably reduced. The time required to bring the tips of the corn plants to the surface of the soil was not materially changed by mutilating the seed.

Preliminary notes are given on popability in corn. Tests with variously cut and filed grains show that any interference with the corneous envelope produces a weak place and prevents the full explosion caused by the heat. The degree of ripeness of the grains was also found to influence their explosiveness. Where three ears were taken from the same stalk the oldest ear gave the highest and the youngest ear the lowest of fully popped grains. The largest degree of popability is likewise associated with the heaviest grains and greatest volume and specific gravity. A test for the influences of the shape of grain upon popability was made in connection with size and dentedness. The data secured show that the shape, whether round, flat, or dented, determines the popability in the cross much more than size. It is further noted that the factor for general shape and that for tip shape when all the grains are considered are of the same determining power.

In the work with peppers special prominence was given to the Golden Queen-Red Cluster cross in its second generation. This cross is discussed with reference to the occurrence of standard and dwarf plants, single and fascicled foliage, large and small leaves, color of the fruit, size and shape of the fruit, position of the fruit on the plant, flavor of the fruit, thickness of the fruit wall, seed cavities of the fruit, size of the seeds, and prolificness of the plants. Records are also given of a number of F_3 pepper crosses. Among general observations on F_3 crosses it was found that with some of these crosses the inheritance of character is continuous, while with others it appears discontinuous. Barrenness

was found to be associated with fascicled leaves. The color of the fruit whether red or orange, the position of the fruit, and the attachment of the fruit whether deciduous or persistent seemed to conform to the Mendelian rule, red, pendent, and deciduous being dominant to orange, upright, and persistent, respectively.

Inheritance studies in garden plants, E. J. OWEN (*New Jersey Stas. Rpt. 1914, pp. 335–338*).—In continuation of previous work (E. S. R., 32, p. 538), character transmission in some Scarlet Runner bean hybrids is discussed. Growth data are given for the different varieties and crosses of eggplants grown during the season, together with data on limitation studies with beans and eggplants and a brief note on the work of breeding ornamental Hibiscus.

Limitation studies with beans and eggplants continue to show that limiting the yield of a plant to one fruit greatly increases the size of the plant and to a lesser extent the size of the fruit. The root system is also affected in a similar manner.

Report on strain tests of cabbage, C. E. MYERS (*Pennsylvania Sta. Rpt. 1912, pp. 582–772, pls. 78*).—This comprises a full report on the strain tests of cabbage conducted by the station during the period 1909 to 1911, and summarized in Bulletin 119 of the station (E. S. R., 28, p. 539).

Strain test of tomatoes.—Historical sketch of the tomato, C. E. MYERS (*Pennsylvania Sta. Rpt. 1913, pp. 467–703, pls. 13*).—A detailed account of the strain tests of tomatoes which were previously summarized (E. S. R., 31, p. 236).

Heredity and correlation of structures in tomatoes, B. H. A. GROTH (*New Jersey Stas. Rpt. 1914, pp. 330, 331*).—In continuation of studies of heredity and correlation to tomatoes (E. S. R., 32, p. 537), the author reports on the F_3 generation of crosses between different shaped types in which all seeds were from selfed flowers. It was found that 66 per cent of the selections bred true to shape, while in the previous year, when selection had been made for fruit length, only about 5 per cent bred true. This is believed to indicate that the three fruit shapes, pear, fig, and plum, are only different expressions of one shape factor influenced by different combinations of size factors.

Notes are also given on crosses made between the prairie berry and both red and green fruited varieties of *Solanum nigrum* (E. S. R., 32, p. 538) in which, out of about 2,500 plants, none exhibited the size of fruit and number of locules possessed by the prairie berry.

Orchard experiments, 1914, G. W. MARTIN (*New Jersey Stas. Rpt. 1914, pp. 489–499*).—Experiments with the use of finely divided sulphur as a spray treatment for apples and peaches (E. S. R., 32, p. 550) were continued during 1914.

In the work with peaches, which was conducted at Vineland, a test was made between sulphur dust, sulphur paste, self-boiled lime-sulphur and arsenate of lead, atomic sulphur, and arsenate of lead alone. All of the trees were sprayed with standard lime-sulphur at dormant strength on March 27 before the buds were open. The other treatments were given on May 6, May 21, and June 11, and in some cases July 1. Data secured on this work show that almost perfect control of scab was secured by the use of the sulphur dust and paste applications. At the same time the control of scab by the self-boiled lime-sulphur was adequate from a commercial standpoint and the damage done to the foliage of the trees was considerably less than with the dust and paste preparations. The greatest damage was on the trees treated with the paste. By the first of July the condition of the trees was serious, many of the leaves had fallen and the injured leaves continued to fall during the months of July and August. Peaches from these trees ripened earlier than those on the uninjured trees and

were of markedly inferior quality. Slightly less damage was done to the trees treated with the dust. The trees treated with atomic sulphur were damaged to a considerably less extent. Carman was the most seriously injured variety, Greensboro, Waddell, Reeves Favorite, and Mountain Rose being successively less injured in the order named.

The apple experiments were conducted in a young and vigorous orchard of 7-year-old trees which had received excellent care. The insects which were injurious were the curculio, the codling moth, and the apple aphis. The aphis was controlled by a separate spraying of blackleaf 40, while the damage done by the codling moth was insignificant. The only fungus disease of importance was the scab. This was most serious on the Rome Beauty, where it attacked both the leaves and fruit. The entire orchard received a thorough spraying with scalecide and five summer sprays were given, the first at the cluster-cup stage and the last eight weeks after blossoming. The materials compared included powdered arsenate of lead in solution, Pyrox, commercial lime-sulphur with powdered arsenate of lead, and finely divided sulphur containing 10 per cent arsenate of lead applied both in suspension and as a dust. The arsenate of lead used alone did not spread satisfactorily and failed to protect the fruit from curculio injury. Scab infection was not epidemic in the untreated plat, but the apples were seriously enough injured to present a decidedly unsatisfactory appearance. None of the treatments gave a complete control of scab. Those treated with Pyrox were good except for a certain amount of copper injury, while apples treated with the sulphur solution were small and poorly colored. Apples treated with lime-sulphur and with the sulphur dust were alike noticeable for their superior finish and general excellent appearance.

The results as a whole seem to indicate that the sulphur dust treatment may be fairly comparable to the ordinary wet treatments so far as results are concerned under ordinary farm conditions. The chief advantage claimed for the use of sulphur dust is its rapidity of application. In view of the greater cost of material used and the necessity for maintaining a wet spraying apparatus in addition to the dusting machinery for applying the dormant spray and for protection against the aphis when it occurs, the station is not prepared as yet to recommend the use of sulphur dust to New Jersey farmers.

Some preliminary experiments were started with pears for the purpose of comparing the values of various standard sprays in maintaining the vigor of the foliage and increasing the quality of the fruit. A general survey was also made of the diseases prevalent in the State and to what extent each demands treatment. The spraying materials used included Bordeaux, lime-sulphur, and Pyrox, with substitutions of atomic sulphur for lime-sulphur and Pyrox in the later sprayings on some of the plats. The check plat was sprayed with arsenate of lead. Arsenate of lead was added to all of the earlier sprays, except Pyrox, for the control of codling moth, and blackleaf 40 to all of the later sprays for the control of psylla. No previous winter treatment for psylla was given, and its control was not successful.

The three most serious troubles in the orchard were the brown blotch, black fruit and leaf spot, and copper injury. All of the plats on which good control of brown blotch was secured were sprayed four times with either Bordeaux or Pyrox, the treatments being continued to the end of July or the first part of August. This disease was not controlled in plats receiving late sprayings with lime-sulphur and atomic sulphur. Copper injury was severe on all the Bordeaux plats, relatively slight on one plat sprayed with Pyrox, and absent from the other plat. Fruit russeting was noticeable on the lime-sulphur plats and relatively slight on the others.

The results as a whole tend to show that while Bordeaux mixture when properly applied will control both brown blotch and the black spot, its tendency to injure the fruit makes it desirable to weaken the mixture very much for the earlier application or to substitute lime-sulphur for these sprayings. Cooperative experiments with lime-sulphur, Pyrox, and Bordeaux conducted in a number of orchards showed the lime-sulphur solution to be the most satisfactory of the three.

Fertilization and cultural methods in apple orchards, J. P. STEWART (*Pennsylvania Sta. Rpt. 1912, pp. 497–563*).—In continuation of previous reports (E. S. R., 28, p. 143) this paper presents the results of the station orchard experiments in various parts of Pennsylvania up to the close of the fifth year. The more practical results and deductions from these experiments have appeared in subsequent bulletins of the station (E. S. R., 29, p. 437; 31, p. 45).

The influence of cultural methods and cover crops, alone and with fertilization, upon the yield, growth, and commercial quality of apples, J. P. STEWART (*Pennsylvania Sta. Rpt. 1913, pp. 429–452, pls. 7*).—A progress report on the station's long-continued cultural and fertilizer experiments with apples (E. S. R., 28, p. 143; 29, p. 437). The results here given and discussed are derived from nine experiments, located in different parts of the State, on seven different types of soil. Four of the experiments were started in 1907, and the remainder in 1908.

Summarizing the results secured in the youngest orchards, it appears that the untilled and mulched apple trees have uniformly made a better growth during the first five years than any of the trees receiving the usual orchard tillage and cover crops. As compared with clean tillage alone, followed by weeds or other natural growth, the addition of cover crops has not yet resulted in any material gain, and in certain cases they have appeared to check the growth of the trees somewhat. The addition of vegetables or other tilled intercrops, when accompanied by proper fertilization, has not materially reduced the growth of the trees as compared with the other tillage methods. As measured by their effects on tree growth, hairy vetch and crimson clover have thus far proved best of all leguminous plants, and millet, rape, and buckwheat have been the best among the nonlegumes. The influence of cover crops on moisture supply in both fall and spring often seems to be more important than their relation to humus and plant food. Alfalfa for five years has proved very effective as a mulch producer and as a permanent orchard cover when its growth is prevented from competing directly with the tree roots. In general, moisture conservation appears to be more important to young trees than application of plant food.

In the orchards of early bearing age the results of the experiments are somewhat less clear and less uniform. The treatment involving the sod alone, however, has resulted uniformly in the least growth and the most highly colored fruit of any of the treatments. Thus sod has usually exerted some stimulating influence on the yield. The high color in fruit is attributed to the hastening of maturity in sod. The stimulating effect on yields is believed to be due primarily to mild injury from the sod. The addition of a good mulch to the sod treatment has increased the average yields by about 20 to 35 bu. per acre annually in the younger orchards. The addition of fertilization, with manure especially, has generally resulted in smaller increases on the mulched areas than on the other treatments. Tillage alone and also tillage and leguminous cover crops have usually been surpassed by the mulch treatment, though in one experiment they have excelled in most respects. The addition of cover crops has not yet shown any material gain over plain tillage followed by weeds or other natural growth.

Experiments in the more mature orchards have shown the tillage and cover-crop treatment to be better than the other cultural methods with reference to

yield, growth, and average size of fruit. The chief deficiency of the tillage and cover-crop treatment has been in the fruit color. Assuming that the relative commercial quality of fruit is determined chiefly by its average size and color, it appears that the mulched fruit generally ranks highest in this character, with that grown on cover-crop plats usually following closely. Where fertilization has been added to both the tillage and cover-crop treatment and the sod-mulch treatment, the fertilizer-sod-mulch treatment has given the best yield and most normal growth, the excessive growth occurring on the fertilized and tilled trees being considered undesirable. In one set of experiments the yields on mulched and fertilized trees have been much steadier than those under any other treatment, the off year having been practically eliminated during a period of five years. The chief difference in treatment between the mulched and fertilized trees and those receiving tillage, cover crops, and fertilization seems to consist in the fact that the roots are regularly and materially disturbed in the latter case and not in the former. Hence the author suggests the general advisability of shallower tillage over tree roots, with the possible displacement of the plow entirely wherever conditions will permit. In these experiments fertilization has often proved more efficient on untilled trees than on those receiving tillage. In some cases, however, the applications are evidently utilized better when accompanied by some cultivation. In the majority of cases in these experiments the addition of fertilization has largely neutralized the differences between the results of various treatments, indicating that proper fertilization is often more important than the cultural method.

Supplement to Bulletin 121, J. P. Stewart (*Pennsylvania Sta. Rpt. 1913, pp. 420–429*).—This supplement gives the detailed results obtained up to the close of 1912 from the station apple fertilizer experiments in orchards that are now in bearing. These results were previously summarized in Bulletin 121 of the station (E. S. R., 29, p. 437). The present data are given primarily as a matter of record.

Apple market investigations, 1914–15, C. W. Moomaw and M. M. Stewart (*U. S. Dept. Agr. Bul. 302 (1915), pp. 23, pls. 13*).—This buletin presents the results of studies concerning certain phases of apple marketing and distribution which were conducted during the season of 1914–15.

The subject matter treats of the following phases: Conditions preceding the movement of the crop; effect of the war upon export prospects; effect of the war upon the home markets; conditions in the New York State orchard district; tracing distribution; retail methods and costs; market preferences for varieties; grades—boxed, barreled, bulk; the effect of inferior apples upon the market; shipments under ventilation and refrigeration; grade and package laws; cold storage holdings and movement; Pacific Northwest apples via the Panama Canal; and markets in the United Kingdom, Europe, and South America.

Charts showing the total receipts of apples in St. Paul and New York City during selected periods, together with charts showing total receipts and wholesale prices of certain varieties in New York City during the 1909–10 season are appended.

Studies conducted in the markets during the fall of 1914 indicated the need for more strict grading and careful handling, the elimination of culls from the fresh-fruit markets, more intelligent distribution, and the effective operation of cooperative associations.

Peaches for Pennsylvania, J. P. Stewart (*Pennsylvania Sta. Rpt. 1912, pp. 564–571*).—This paper has previously been noted from another source (E. S. R., 28, p. 742).

Peach supply and distribution in 1914, W. A. Sherman, H. F. Walker, and L. H. Martin (*U. S. Dept. Agr. Bul. 298 (1915), pp. 15, pl. 1, figs. 2*).—This

bulletin presents the results of a survey of the supply and distribution of peaches in the United States during the 1914 season. Reports were received from 993 shipping points at which peaches originate in car lots. Diagrams and a map are given showing the comparative shipping seasons of the different States and the comparative volume of shipments from the leading areas, together with tabular data showing actual shipments for 1914, where known, and estimates based on the 1913 shipments in other cases for the individual shipping stations.

The effect of lime on the strawberry, W. J. WRIGHT (*Pennsylvania Sta. Rpt. 1912, pp. 773–790, pls. 17*).—The introductory considerations in this paper call attention to the lime requirements of widely differing economic plants and briefly notes the experience of a number of practical growers in the use of lime for strawberries. An account is then given of five separate experiments conducted to determine the effect of lime on the growth and fruiting of the strawberry. One of these experiments was conducted under field conditions; the others were pot experiments conducted under control conditions.

The experiments as conducted for one season show that the addition of lime retards the blossoming and fruiting period from three to six days. The total number of fruits picked from the unlimed plats was greater than from the limed plats and the total weight was slightly greater but the average weight per fruit was less. The plant growth was greater in every case on the unlimed plats. The caustic effect of hydrated lime was very severe on the roots of strawberries. The effect of carbonate of lime was less severe but it made the roots dark colored and brittle. Plants treated with carbonate of lime at the rate of 4,000 and 8,000 lbs. per acre were checked in growth but were not killed. The application of carbonate of magnesium at the rate of 3,150 lbs. per acre, equivalent to 2,100 lbs. of CaO, proved fatal to the plants. Strawberries grew well in a soil too acid for clover. The addition of lime to such a soil lessened the growth of strawberries while it made possible the growth of clover. The addition of lime is deemed especially detrimental to the formation of runners and young plants.

Experiments with fertilizers on cranberries, J. H. VOORHEES (*New Jersey Stas. Rpt. 1914, pp. 247–251*).—The cooperative fertilizer experiments on cranberries outlined in the previous report (E. S. R., 32, p. 541) were continued.

Data are given showing yield and size tests of berries from the various plats for 1913 and 1914. Compiling the results from all the plats to which three elements of plant food were given, there was an average increase in yield of 29 per cent in 1913 and 23 per cent in 1914 and an average increase in size of berries of 10 per cent in 1913 and 15 per cent in 1914. Plats which received only nitrogen gave an increase in yield of 6 per cent and in size of 5 per cent in 1913, and an average decrease in yield of 7 per cent with an increase in size of 3 per cent in 1914, thus indicating that nitrogen applied alone at the rate of 40 lbs. per acre is excessive and tends to cause runners to grow at the expense of fruit bud formation and fruit development. Plats receiving phosphoric acid in different forms gave an average increase in yield of 9 per cent and an increase in size of 5 per cent in 1913, and an increase in yield of 18 per cent with no increase in size in 1914. The potash plats showed an increase in yield of 15 per cent and in size of 12 per cent in 1913, and an increase in yield of 8 per cent and in size of 5 per cent in 1914. With reference to sources and form of the materials, the observations on growth indicate that nitrate of soda, acid phosphate, and muriate of potash have given the best results.

Preliminary tests were started to determine the adaptation of cranberries to soils having varying amounts of acidity. This test also includes the use of finely powdered copper sulphate, manganese sulphate, sulphur, and ground limestone in varying quantities.

A note is given on experiments with fertilizers on newly set bogs. In this work there was some evidence of fertilizer injury which, it is believed, was caused by lack of proper drainage and irrigation.

The cultivation of peppermint and spearmint, W. VAN FLEET (*U. S. Dept. Agr., Farmers' Bul. 694 (1915), pp. 12*).—This describes the peppermint and spearmint industry in the United States with reference to the extent of the industry, plants grown for the production of peppermint and spearmint, cultural requirements, fertilizers, diseases and pests, yield, cost, and prices.

According to the best obtainable estimates the total area of mint in 1914 in the principal States of production, namely, Michigan, Indiana, and New York, appears to be a little less than 25,000 acres, of which nearly 5,000 acres were spearmint. Almost one-half of this acreage was new plantings, the remainder being in fields two or more years old. It is concluded that mint culture on suitable soils gives a fair average return, but that the industry is especially subject to fluctuations in prices and likely to suffer from overproduction if the acreage is too rapidly extended.

Pecans: Varieties, influences of climate, soil, and stock on scion, H. P. STUCKEY (*Georgia Sta. Bul. 116 (1915), pp. 299–328, figs. 11*).—This bulletin presents the results of studies conducted on the station grounds and in other sections of Georgia during the past seven years.

Data are given showing the character of the tree as well as the character and yield of nuts for a large number of varieties set out, for the most part, in 1908. Summing up the evidence for varieties thus far secured the Money Maker and Robson are the two leading varieties with reference to vigor and early bearing in the trees and quantity, quality, and early ripening in the nuts. These nuts, while not so thin shelled nor quite so large as a number of others, run high in percentage of meat, are of good flavor, crack out well, and are very early and heavy yielders.

From the behavior of the station orchard through seven years, it is calculated that an orchard will come into profitable bearing about the eighth or ninth year after transplanting, the number of trees per acre being an important factor in determining this point for any given orchard. Other factors being equal, the closer plantings yield quicker returns. In holding over samples of the various varieties of nuts from year to year, it has been observed that the nuts harvested in the fall become rancid and inedible soon after warm weather comes the following spring, thus indicating that as large commercial orchards come into bearing special attention must be given to determining the proper temperature for the storage of pecans.

Observations relative to influence of different climate and soils on similar varieties of nuts show that high altitudes and stiff clay soils tend to decrease the size of nuts. Extremely dry seasons tend to shorten the nuts in proportion to their thickness. Most of the varieties, however, hold in a very pronounced form certain of their individual characteristics regardless of changes in size. The constancy of the percentage of meat or kernel of each variety grown under widely separated soil and climatic conditions is rather marked.

Data were secured from experiments conducted by H. W. Smithwick in which a hickory tree was top-worked with fourteen varieties of pecans. A comparison of nuts grown on these scions with nuts of similar varieties grown on pecan stock suggests that top-working pecans on hickory stock greatly reduces the size of the nuts. The shells of the pecans grown on this particular hickory stock were perceptibly thinner than the shells of similar varieties on pecan stock. The percentage of meat was somewhat larger in the nuts grown on hickory stock; at the same time there was a lack of uniformity in the filling of the shells as compared with the nuts grown on pecan stock.

The experience of F. B. Guinn, of Rusk, Tex., in top-working hickories with pecans is noted and appears to confirm the above reported observations relative to the tendency of hickory stock to dwarf pecan nuts.

Information is also given relative to soils adapted to pecan culture, soil preparation, fertilizers, planting, care and cultivation of the trees, and propagation by means of grafting and budding.

FORESTRY.

Forestry in the United States at the present day, J. W. Toumey (*Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases, 6 (1915), No. 6, pp. 779–785*).—A popular account relative to progress made in national, state, and private forestry in this country.

Acts of assembly relating to forests and forestry, edited by J. Kalbfus (In *Digest of Game, Fish, and Forestry Laws, 1915. Harrisburg, Pa.: State, 1915, pp. 257–342*).—This comprises a digest of all the acts passed by the Pennsylvania Assembly through the year 1915 relating to forests and forestry.

Planting forest trees on idle lands in New York (*N. Y. State Col. Forestry, Syracuse Univ., Ser. XIII, No. 2C (1913), pp. 15, figs. 6*).—This bulletin discusses the utilization of idle nonagricultural lands in New York, with special reference to the improvement and the extension of woodlands.

The northern hardwood forest: Its composition, growth, and management, E. H. Frothingham (*U. S. Dept. Agr. Bul. 285 (1915), pp. 79, pls. 15*).—This bulletin outlines the extent, general characteristics, and economic importance of the northern hardwood forests, briefly describes the silivicultural features of the principal species, and points out the methods of managing hardwood stands which appear to be best calculated to furnish a continuous supply of the different woods.

A series of volume tables for northern hardwoods for use in estimating the quantity of standing timber is appended.

The trees and shrubs of the Pacific coast, F. R. S. Balfour (*Jour. Roy. Hort. Soc., 41 (1915), No. 1, pp. 21–27, pls. 12*).—A descriptive sketch of the flora occurring in four regions along the Pacific coast, and believed to be representative of differences brought about by rainfall, latitude, and altitude on the Pacific slope from British Columbia to Southern California.

Trees of the Cambridge Botanic Garden, R. I. Lynch (*Jour. Roy. Hort. Soc., 41 (1915), No. 1, pp. 1–20, pls. 12*).—Descriptive notes are given of some fifty of the most important trees in the Cambridge Botanic Garden.

The rubber plants of southern Italian Somaliland, G. Scassellati-Sforzolini (*Agr. Colon. [Italy], 9 (1915), No. 9, pp. 521–545, pls. 3, fig. 1*).—In the first part of this paper the author gives an account of different native rubber plants in Italian Somaliland, together with analyses of the latexes and miscellaneous information relative to these plants. The second part of the paper gives an account of the experimental culture of Ceara rubber in this colony.

Timber physics.—Treatise on timber tests and summary of results, W. H. Warren (*Dept. Forestry, N. S. Wales, Bul. 10 (1915), pp. 28, pls. 2, figs. 10*).—This treatise is based on results of mechanical tests of New South Wales timbers which have been previously published in full (E. S. R., 27, p. 43). The object of the present treatise is to show the application of the results obtained in the test with special reference to their use by the engineer, architect, builder, and student.

Problems in kiln drying lumber, H. D. Tiemann (*Lumber World Rev., 29 (1915), No. 6, pp. 21–23, figs. 8*).—In this paper the author describes a number of practical problems and difficulties which are encountered in the kiln drying of

wood. Consideration is given to shrinkage and moisture, air drying, kiln drying, properties of the wood which affect drying, causes of various effects that result from drying, and factors to be considered in overcoming the difficulties in drying.

Preservative treatment of fence posts, G. B. MacDonald (*Iowa Sta. Bul. 158 (1915), pp. 85–151, figs. 32*).—This bulletin deals with the results of various experiments at the station during the past 12 years on the durability of Iowa fence-post woods and with methods and results of preservative treatment.

It is considered probable that by effective creosote treatment woods such as white cedar, oak, etc., commonly used for posts may be doubled in life and that many species at present almost valueless, such as willow, soft maple, cottonwood, and elm can be made to last 25 or more years with only a small addition in cost for treatment. It is suggested that the native soft-wooded trees be selected for treatment and the oaks, hickories, black walnuts, etc., be saved for other purposes. Small posts, about 4½ in. in diameter, if of sufficient strength, should be selected, thereby saving from 3 to 6 cts. per post on creosote. The posts should be thoroughly peeled of the inner and outer bark and should be thoroughly seasoned before treatment. The hot creosote should be kept at a temperature not to exceed 220° F., as a high temperature causes an excessive loss by evaporation. The tank should contain sufficient creosote to give the ground line of the posts a good penetration, as the thoroughness of treatment just above and below the ground line is considered to determine the life of the post. The penetration of creosote at the ground line of one post of each lot should be tested, and the heartwood should be tested for penetration when split posts are being creosoted. It is considered advisable to have 6 in. of well-preserved wood above the surface of the ground, and the tops of willow, soft maple, cottonwood, boxelder, basswood, aspen, and hickory should be treated by dipping them into the hot creosote.

A small portable tank installed on the farm or a small cooperative plant is recommended. Creosote remaining after one season's treatment may be rebarreled and stored for the following year's work, and a portable tank should be stored or otherwise protected after the season's work.

Report of government chemist on destructive distillation of fir waste, giving methods and results of tests made at University of Washington, G. M. Hunt (*West Coast Lumberman, 29 (1915), No. 336, pp. 26–28, figs. 4*).—This article gives the methods and results of tests conducted cooperatively by the Forest Service of the U. S. Department of Agriculture and the University of Washington, and summarizes the conclusions relative to different processes of fir distillation.

Indiana's wood-using industries, compiled by J. C. Nellis (*Hardwood Rec., 40 (1915), Nos. 10, pp. 15–18; 11, pp. 19–21; 12, pp. 14–17*).—This comprises a statistical study conducted by the Forest Service of the U. S. Department of Agriculture with reference to the various wood-using industries of Indiana. Data are given showing the kinds and quantity of local woods and of woods from other regions used in these industries, together with the use which is made of each kind of wood and the properties of the woods that especially fit them for various uses.

DISEASES OF PLANTS.

Report of the plant pathologist, M. T. Cook (*New Jersey Stas. Rpt. 1914, pp. 467–476*).—An account is given of the organization of the department of plant pathology at the station and of the work carried on in inspection of nursery stock, investigations of plant diseases, etc.

A list is also given of the plant diseases observed during 1914, the list being arranged alphabetically according to host plants.

Department of botany, C. R. Orton (*Pennsylvania Sta. Rpt. 1913, pp. 147–151*).—A progress report is given of a study of the apple collar rot and its control, winter blight or spring disease of tomatoes, the effect of soot and included gases on growing plants, apple rust, chestnut blight, a plant disease survey of Pennsylvania, and an investigation of the practical value of asphaltum as a dressing for cuts and wounds on fruit trees.

In connection with the apple collar rot investigations, some organisms have been isolated, and inoculation experiments are under way for the determination of their connection with the disease. As a result of investigations on its control, the author recommends cutting out the wounds and dressing with asphaltum, provided the injury is in its early stage.

The winter blight or spring disease of tomatoes seems to be limited to greenhouse growing of this vegetable, and experiments in which root material, soil, and lesions of stem, leaf, and fruit were tested as causes of this disease, were carried out without definite results. The study of the soil suggests that there is a possible correspondence to the amount of acidity in the soil rather than any particular element.

An attempt was made to determine the length of the period of germination and sporidial formation on the red cedar, with weather conditions influencing the same, and also, if possible, to determine the susceptible period of infection by apple rust for the apple leaves and fruit. Bagging experiments were carried out on wild crab-apple trees in close proximity to red cedars abundantly infected with Gymnosporangium. There appears to be a fairly definite period in the development of the leaves when they are most susceptible to infection from the cedar. Whether this is primarily due to an inherent resistance in the apple leaves at certain periods, or whether it is caused by atmospheric conditions favorable to the germination of the rust spores has not been determined.

In the investigations with asphaltum as a dressing for cuts and wounds, 7 different forms were used and compared with 6 forms of dressings more or less in common use. Particular attention was paid to the healing, persistence, fungicidal value, waterproof qualities, and the ease with which the compound may be applied. The conclusions drawn from the preliminary observations indicate that serious checking tends to prevent healing; if small wounds are not smoothly made, healing will be arrested; immediate application of asphaltum prevents a tendency of the bark to pull away from the cambium, and healing results very quickly; applications made in the summer did not heal as quickly as cuts made in the spring; in general, results favor this substitute as offering a cheaper and more effective wound dressing.

Sulphur arsenical spray injury and its prevention, J. P. Stewart (*Pennsylvania Sta. Rpt. 1912, pp. 571–578, pl. 1*).—This is a reprint in slightly modified form of the address previously noted (E. S. R., 28, p. 48).

Perennial mycelium in species of Peronosporaceæ related to Phytophthora infestans, I. E. Melhus (*U. S. Dept. Agr., Jour. Agr. Research, 5 (1915), No. 2, pp. 59–70, pl. 1, fig. 1*).—The author gives results of experiments and observations on several North American species of Peronosporaceæ, viz, *Peronospora parasitica, P. ficariæ, P. viciæ, Cystopus candidus,* and *Plasmopara halstedii,* comparisons being made with *Phytophthora infestans.* The results obtained indicate that several species of these four genera may be perennial in the tissues of their hosts, the mycelium passing the winter either in the aerial or in the underground organs of winter annuals, biennials, or perennials.

A list of literature cited is given.

An anthracnose of red clover caused by Glœosporium caulivorum, H. R. FULTON (*Pennsylvania Sta. Rpt. 1912, p. 249*).—The appearance, progress, and effects of the disease are described. Its occurrence has been previously noted (E. S. R., 23, p. 448).

Moist weather conditions, combined with rapid succulent growth, favor the fungus (*G. caulivorum*), which attacks most readily at points of injury on the stems. The spores are not readily disseminated by wind, and the disease spreads rather slowly. Development of a new crop of spores requires about a week after infection. The spores retain their vitality for a number of months, and the seeds may carry the infection, as may also clover trash. The fungus may live over to a second season in tissues of the plant.

Control measures include crop rotation (using clover sod for one season only in the series), fall plowing of clover sod, early mowing of affected fields, and use of clover seed from healthy crops, or of seed that have been cleaned of trash and disinfected by soaking for 15 minutes in formalin solution, 1 oz. to 3 gal. of water.

Germination of seed of clover dodders, H. R. FULTON (*Pennsylvania Sta. Rpt. 1912, pp. 250, 251*).—This is a report of studies on the two kinds of dodder common in clover fields in Pennsylvania, *Cuscuta arvensis* native to North America, and *C. epithymum* introduced from Europe.

Precautions to be taken in field practice are use of seed known to be free from contamination, separate cutting of affected areas as soon as found, and burning of the dried hay in place after sprinkling with oil.

Hibernation of Phytophthora infestans in the Irish potato, I. E. MELHUS (*U. S. Dept. Agr., Jour. Agr. Research, 5 (1915), No. 2, pp. 71–102, pls. 5, figs. 3*).—As a result of experiments, the author claims that the mycelium of *P. infestans* spreads in the tissues of the potato tuber and finally reaches the sprouts. The growth of the fungus is retarded when diseased tubers are held in dry soil or at temperatures below 5° C. Infected tubers rot rapidly when placed in warm wet soil, and this fact is believed to explain the wide variation in stand observed by earlier writers. The mycelium of *P. infestans* may remain alive in seed tubers planted in the soil for at least 45 days, and it is considered possible that under less favorable conditions for the soft rots the fungus may live longer. None of the author's observations tend to show that the potato fungus is latent in the stems and leaves of plants growing from diseased tubers, as is sometimes claimed.

Laboratory tests showed that the fungus infects not only the sprouts but also the shoots that break through the soil, the mycelium growing from the tuber into the stem, where it travels up to the surface and forms spores. This usually takes place in the small dwarfed shoots of the hill, which may become the centers for serious infection.

Conidia of *P. infestans* may be borne on the cut surfaces and sprouts of tubers when planted under field conditions, but as the cut surface corks over or the tuber decays, the fructification of the fungus decreases. No evidence was obtained tending to show that conidia borne in the soil are instrumental in starting foliage infection.

A list of publications pertaining to this subject is added.

Report of potato scab experiments, 1914, H. C. LINT (*New Jersey Stas. Rpt. 1914, pp. 477–488, fig. 1*).—A report is given of experiments carried on for the control of potato scab, in which particular attention was paid to formalin for treatment of seed potatoes and of sulphur as applied to the soil. The principal conclusions have been given elsewhere (E. S. R., 33, p. 246).

Histological relations of sugar-beet seedlings and Phoma betæ, H. A. Edson (*U. S. Dept. Agr., Jour. Agr. Research, 5 (1915), No. 1, pp. 55–58, pls. 2*).—In a previous publication (E. S. R., 33, p. 246), the author pointed out the infection of practically all sugar-beet seed with the fungus *P. betæ*.

In the present publication an account is given of a study of the seedlings in relation to the fungus. Damped-off and root-sick seedlings were selected at different stages of the disease, and it was found that cells of badly diseased but still living seedlings were often nearly filled with the fungus, which showed a tendency to remain in the interior of the cell rather than in the middle lamella. Occasionally the fungus was observed running between the cells, but the indications are that, while it dissolves the middle lamella, it does not feed upon it. In heavily invaded cells the cell walls are consumed, the cytoplasm disappears, and the nuclei disintegrate.

In case of less serious infection, where recovery is possible, the cell walls show a gelatinized condition only in moderate degree and in an area confined to points where the cells have been penetrated by the mycelium.

Sugar beets attacked by the fungus frequently send out new side roots above the invasion, and succeed in preventing the destruction of this new growth. In such cases, the fungus is apparently established in a condition of reduced virulence in the interior tissue of the beets. The invaded cells are not killed and the adjacent ones appear perfectly normal in every respect.

Attention is called to the difficulty of explaining how an organism capable of such complete destruction has its action suddenly checked and confined to a saprophytic existence in the infected area.

The diseases of the sweet potato and their control, J. J. Taubenhaus and T. F. Manns (*Delaware Sta. Bul. 109 (1915), pp. 3–55, pls. 26*).—The authors give an account of the following diseases of sweet potatoes, describe the organisms which cause them, and give accounts of their distribution, the loss occasioned by their presence, and means of control: Black rot (*Sphæronema fimbriatum*), vine wilt or yellows, also called stem rot (*Fusarium batatatis* and *F. hyperoxysporum*), soil rot (*Acrocystis batatas*), soil stain or scurf (*Monilochætes infuscans*) dry rot (*Diaporthe batatatis*), foot rot (*Phenodomus destruens*), white rust or leaf mold (*Cystopus ipomœæ panduranæ*), Septoria leaf spot (*S. bataticola*), soft rot and ring rot (*Rhizopus nigricans*), Trichoderma rot (*T. koningi*), charcoal rot (*Sclerotium bataticola*), and the Java black rot (*Diplodia tubericola*).

The black rot is claimed to be carried with the seed to the seed bed, and from there to the land. The stem wilt or yellows is also carried inside the seed, and, it is claimed, may also persist for a long time in the land. Soil rot is said to be a very severe disease when once introduced in the soil, but its presence in Delaware is as yet limited to one section. Soil stain is a superficial disease which affects only the market value of the roots and not their edible quality. White rust is said to often cause premature dying of the foliage, but the leaf spot, though prevalent in Delaware, is of little economic importance. The soft rot, ring rot, Trichoderma rot, and charcoal rot are storage troubles, some of which are quite serious.

For the prevention of these diseases, the authors give various suggestions, which include seed treatment in which corrosive sublimate is said to give better results than formaldehyde, although formaldehyde is recommended for the disinfection of the seed-bed soil. For prevention of the storage troubles, proper attention should be given to temperature, ventilation, etc.

Apple collar rot, H. R. Fulton (*Pennsylvania Sta. Rpt. 1912, pp. 251–253*).—Collar rot of apple trees, which is described as to its general symptoms and progress, was studied in Pennsylvania in 1910 and 1911.

While three organisms, *Bacillus amylovorus*, *Sphæropsis malorum*, and *Schizophyllum commune*, were isolated from affected bark, it has not been shown that any of these are primarily responsible for the trouble, as no infection experiments were successful with young trees.

Satisfactory results have in a number of cases followed a treatment consisting in the removal of all affected bark as soon as detected, leaving a clean-cut edge of healthy bark which is then washed with a good disinfectant and covered with a coating of mixed lead paint and boiled linseed oil or with a coating of tar or asphaltum in case of parts below the surface of the ground. Extensive wounds should be covered with a sheet of grafting wax to promote tissue formation. Wounds made to remove borers should be disinfected, overbearing and excessive leafage should be prevented, and the roots should be given sufficient fertilizer, aeration, and water.

Jonathan spot rot, M. T. Cook and G. W. Martin (*New Jersey Stas. Rpt. 1914, pp. 500–503*).—This is a detailed account of investigations, the results of which have already been noted (E. S. R., 31, p. 748; 33, p. 348).

Orange or cedar rust of apple, H. R. Fulton (*Pennsylvania Sta. Rpt. 1912, pp. 253, 254*).—Results are given of studies testing the relative importance of the several factors or conditions resulting in the infection of apple by the orange or cedar rust fungus (*Gymnosporangium macropus*).

Spraying experiments to control rose mildew and black spot, M. A. Blake and C. H. Connors (*New Jersey Stas. Rpt. 1914, pp. 38, 39*).—The authors report some experiments to test the efficiency of formaldehyde solutions for the control of rose mildew and black spot under greenhouse conditions. American Beauty rose plants were potted and allowed to reach a good condition of growth, when different lots were sprayed with formaldehyde diluted in the following proportions: 1:300, 1:250, 1:200, 1:150, and 1:100. All these dilutions were used with safety, no burning resulting, and although the plants when potted were badly infected with black spot, after spraying the spots ceased to spread.

A similar experiment with Killarney, using a dilution of 1:250, was undertaken, the results of which were disastrous, as nearly all the leaves were lost from the plants. This experiment is believed to indicate the danger of untried spray materials, and also the difference in resistance to injury on the part of different varieties.

Chestnut bark disease, H. R. Fulton (*Pennsylvania Sta. Rpt. 1912, pp. 254, 255*).—This is a brief note on the progress of a study on the life habits of the chestnut blight fungus (*Diaporthe parasitica*), on the various factors which may affect its activity, and on species related to that fungus.

Physiological studies on the chestnut blight disease, R. A. Waldron (*Pennsylvania Sta. Rpt. 1913, pp. 152–156, pls. 4*).—A brief account is given of investigations carried on by the author, in which the morphology of the fungus *Endothia parasitica*, the germination of its spores, and their methods of dissemination were studied.

A Nectria parasitic on Norway maple, M. T. Cook (*New Jersey Stas. Rpt. 1914, p. 504*).—The substance of this article has already been noted (E. S. R., 33, p. 249).

ECONOMIC ZOOLOGY—ENTOMOLOGY.

Game laws for 1915.—A summary of the provisions relating to seasons, export, sale, limits, and licenses, T. S. Palmer, W. F. Bancroft, and F. L. Earnshaw (*U. S. Dept. Agr., Farmers' Bul. 692 (1915), pp. 64, figs. 4*).—This, the sixteenth annual summary of the game laws of the United States and Canada, has been prepared on the same general plan as those previously issued (E. S. R., 32, p. 244).

A review of the American moles, H. H. T. Jackson (*U. S. Dept. Agr., Bur. Biol. Survey, North American Fauna No. 38* (*1915*), *pp. 100, pls. 6, figs. 27*).—It is pointed out that moles are widely distributed throughout a large part of North America and are very numerous in many places. While they have in some localities proved injurious to agriculture, they are generally beneficial through the destruction of insects, which form much of their food.

The present paper is intended to serve as a basis for investigations of their economic status, careful investigations of which are said to be under way. The present work, which is largely systematic, recognizes five genera, namely, Scalopus, represented by three species with eleven varieties; Scapanus by four species with nine varieties; Neürotrichus by one species with two varieties; and Parascalops and Condylura by one species each. Keys are given for the separation of the genera, species, and subspecies. The accounts of the species and subspecies include their synonymy, type locality, geographic range, general characters, etc., together with a list of the number and locality from which specimens were obtained.

Distribution and migration of North American gulls and their allies, W. W. Cooke (*U. S. Dept. Agr. Bul. 292* (*1915*), *pp. 70, figs. 31*).—This bulletin presents information regarding the ranges of the several species of gulls, including skuas and jægers, especially the breeding ranges and migrations, and includes data for use for legislative reference to serve as a basis for legal protection for the species by States in which they are found. They are represented in the United States by 22 species or subspecies and are important as scavengers, enemies of mice, and of insects.

Report of the entomologist, T. J. Headlee (*New Jersey Stas. Rpt. 1914, pp. 339–399*).—In the first part of this report the author presents a general outline of the work including a classified tabular statement of the name, date, and locality from which insects were received. Notes are next presented on the insects of the year, the more important of which are the grape leaf-hopper, pear psylla, plant lice, San José scale, oyster shell scale, false apple red bug (*Lygidea mendax*), potato flea-beetle (*Epitrix cucumeris*), rose chafer, May beetle, strawberry weevil, white pine weevil (*Pissodes strobi*), hickory bark beetle (*Scolytus quadrispinosus*), an unusual greenhouse insect, viz, *Eucactophagus graphipterus*, army worm, apple tree tent caterpillar, Florida fern caterpillar (*Eriopus floridensis*), Argentine ant (*Iridomyrmex humilis*), etc.

Experiments by C. S. Beckwith in combining nicotin preparations with spraying mixtures led to the conclusion that black leaf 40 and "Nickotiana" can be mixed with the common spray mixtures without a serious precipitate forming and without any apparent detriment to the nicotin.

A report on Potato Spraying and Dusting Experiments for the year 1914, by A. E. Cameron (pp. 361–381) presents data previously noted (E. S. R., 33, pp. 336, 636), and a report on Fly Control on the College Farm, by C. H. Richardson (pp. 382–399) is noted on page 160.

Outdoor wintering of bees, E. F. Phillips and G. S. Demuth (*U. S. Dept. Agr., Farmers' Bul. 695* (*1915*), *pp. 12*).—This popular account of the care which should be given bees when wintered outside is based in part upon investigations previously noted (E. S. R., 31, p. 254).

Grasshoppers and their control on sugar beets and truck crops, F. B. Milliken (*U. S. Dept. Agr., Farmers' Bul. 691* (*1915*), *pp. 16, figs. 11*).—This bulletin deals with the four species of grasshoppers which were responsible for most of the injury to Kansas truck crops during 1911, 1912, and 1913, namely, the differential grasshopper (*Melanoplus differentialis*), the two-lined grasshopper (*M. bivittatus*), the lesser migratory grasshopper (*M. atlanis*), and the

Bruner grasshopper (*Aeoloplus bruneri*). A brief description is given of the four species, followed by accounts of egg laying, development, habits, climatic checks, natural enemies, and control measures, including destruction of the eggs by plowing, harrowing, and disking, and destruction of the young and adults by poisoned bran mash, the hopperdozer, burning, and the utilization of poultry and of hogs. Methods of protecting sugar beets, truck crops, and gardens are also considered.

Fleas as pests to man and animals, with suggestions for their control, F. C. Bishopp (*U. S. Dept. Agr., Farmers' Bul. 683* (*1915*), *pp. 15, figs. 6*).—A popular account.

The grasshopper outbreak in New Mexico during the summer of 1913, H. E. Smith (*U. S. Dept. Agr. Bul. 293* (*1915*), *pp. 12, figs. 2*).—An outbreak of the so-called long-winged grasshopper (*Dissosteira longipennis* [*Oedipoda nebracensis*]) in the Pecos Valley of New Mexico was one of the most important of the several grasshopper outbreaks that took place in the United States in 1913. The present bulletin describes the distribution of *D. longipennis* in America, its seasonal history, the origin of the outbreak, the nature of its habits, food plants, parasitic and predaceous enemies, and artificial remedies.

A list of 15 references to the literature cited is appended.

The Zimmerman pine moth, J. Brunner (*U. S. Dept. Agr. Bul. 295* (*1915*), *pp. 12, pls. 11*).—This is a report of work with *Pinipestis zimmermani* commenced in the fall of 1912 and continued during 1913–14 in conjunction with other work with forest insects, particularly in Montana and Idaho.

This pine moth is very destructive to coniferous trees, especially to yellow pine (*Pinus ponderosa*) in various sections of the West; and also injures other species of pine. It is largely the cause of "spike-top" in mature timber, and it spike-tops, stunts, and kills outright innumerable trees of the so-called "second growth." Correspondence and collections show it to occur almost everywhere in the West, and it has also been reported from the Eastern States. Its habits and the result of its larval work also apparently do not vary materially anywhere in its range.

It attacks mature trees from between 10 to 30 ft. from the top down, and second growth from about breast high up to from 35 to 40 ft. "Fresh infestation is only indicated by the castings on the surface area of the attacked trees. . . . During the spring following infestation drops of pitch usually begin to ooze out of the tunnels in the bark and cover the surface of the average wound with a uniform, thin layer, somewhat similar in appearance to a liberal application of paint with a brush. The inner bark assumes a spongy appearance and gains in thickness, which tightens and even breaks the outer bark, together with the dried pitch covering it. The entire infested space finally presents a strikingly rough aspect which resembles the injury of no insect except *Pissodes schwarzi*, which produces a similar effect at the base of trees. By repeated infestation at the border of the wound, in the course of years the tree is gradually girdled and the part above the collar dies and finally rots off at its base, provided the moth abandons the tree at this stage. But frequently infestation continues downward, on young trees usually until the lower branches, which by that time show a tendency to develop into tops, are reached and the trees killed, and on mature ones to a point where the thickness of the bark fails to suit the insect. . . . The wood from trees that have been infested by the moth is invariably so permeated with pitch that the lumber cut from such logs is either materially reduced in value or is rendered wholly unfit for commercial use."

The eggs are deposited during any of the milder months, and larvæ of all sizes, except the most minute in winter, may be found at any time of the year. "On approaching maturity, about the middle of June, the larva grows sluggish

and is found to be transformed into the chrysalis within a few hours. . . . The period of pupation in captivity under varying temperatures and during all seasons within a period of two years has in all cases proved to be exactly 29 days. Eggs laid the previous autumn hatch in early spring and develop into adults during August and September of the same year, while eggs deposited during May evidently develop into adults early the following spring." Eggs deposited in July appear to hatch within about two weeks.

"In most sections of the Rocky Mountains the Rocky Mountain hairy woodpecker (*Dryobates villosus monticola*) is unquestionably the most efficient natural force in restraining the Zimmerman pine moth. Thousands of trees are each year regularly infested by the moth in comparatively small areas, and this bird as regularly destroys almost all of the larvæ in all of them during early winter. . . . The cocoon of a pimplinid of a new genus and new species is frequently found in the tunnels of the pine moth in Montana and Idaho. In some localities this parasite kills as many as 80 per cent of the larvæ of the moth in second-growth trees. . . . Another, somewhat larger parasite (*Ichneumon* n. sp.), is frequently found during winter in the chrysalis of the moth. . . .

"To end 'spike-topping' in mature stands, and to eliminate damage in growing timber, or at least reduce it to a negligible amount, it is necessary to remove (1) those trees which, below the spike, show branches with yellow needles (a certain indication of present infestation), (2) those which are struck by lightning and remain green, as the moth usually breeds in great numbers along the lightning scars, and (3) those which display knobby growths on branches, they being in many localities the most prolific source of replenishment of the moth."

The apple aphids and red bugs and their control, J. P. Stewart (*Pennsylvania Sta. Rpt. 1913, pp. 452–458, pls. 4*).—A brief account of these insects with directions for their control.

Fly control on the college farm, C. H. Richardson (*New Jersey Stas. Rpt. 1914, pp. 382–399*).—This is a report of work carried on from April 24 to November 1, 1914, in continuation of that of the previous year (E. S. R., 32, p. 551).

The work is presented under the headings of studies of the fly fauna of the college farm, species which are attracted to milk, breeding places, annotated list of the flies seen upon the college farm, experiments with baits for fly traps, laboratory and outdoor experiments with various larvicides control of the fly breeding in horse stalls, etc.

The work of the year indicates that surface treatment of manure piles with iron sulphate will not result in the total elimination of the larvæ contained therein. While better results were obtained in the use of borax, the number of larvæ and pupæ killed was not entirely satisfactory. In a test of the effect of larvicidal doses of iron sulphate and bleaching powder ($CaOCl_2$) on the growth of barley, bleaching powder had a very disastrous effect, but the results did not indicate that the fertilizer value of manure would be injured by the iron sulphate. In experiments pyroligneous acid failed to repel the adult house fly or prevent its breeding in manure. It was found that 100 lbs. or less of iron sulphate properly applied will undoubtedly keep horse stalls free of larvæ through the fly season. Flight experiments show that flies came into the barns from a considerable distance. Tests of ammonia show its attractiveness for house flies to be feeble, while it is concluded that skatol and indol deserve a trial as baits for fly traps, although their present cost would probably limit their use to rather weak solutions.

Report on the mosquito work for 1914, T. J. Headlee (*New Jersey Stas. Rpt. 1914, pp. 401–466*).—This detailed report of the mosquito work carried on

under the entomologist's direction during 1914 includes an account of the salt marsh work done under the Little Silver contract, by C. S. Beckwith (pp. 415–447), discussions of the mosquito problems in the several counties, mosquitoes of the year, etc.

Spraying experiments to control thrips upon roses in the greenhouse, M. A. Blake and C. H. Connors (*New Jersey Stas. Rpt. 1914, pp. 39, 40*).—It is stated that several florists who have used a combination of sugar, water, and Paris green against thrips on roses in the greenhouse appear to have successfully controlled this pest. It is thought that the change which occurs in the mixture may result in the formation of arsenic sucrate or arsenic glucosate. Application of the formula above mentioned to American Beauty roses in the demonstration greenhouse gave successful results and no burning of any consequence resulted. However, when the sugar was replaced by molasses severe burning ensued.

Results of spray tests in which white sugar, brown sugar, and molasses were used in the formula are presented in tabular form. When white sugar was used no serious burning resulted, whereas brown sugar gave a slight burning and molasses was found to be unsafe to use.

Peach borer observations at Vineland, M. A. Blake and C. H. Connors (*New Jersey Stas. Rpt. 1914, pp. 75–81, pls. 7*).—The authors present records of the borers removed from trees in the experimental orchards and the time required for removing them. The observations are summarized as follows:

"A rather complete study for two years in orchards containing over 60 varieties of peaches does not indicate that one variety is more immune from the attacks of the peach borer than another. Certain sections of orchards become infested more quickly and more completely than others. Outside rows are commonly more severely infested than interior rows, even regardless of the surrounding conditions. Trees once infested or injured are apparently very susceptible to continued attack. Rows of trees badly infested one year are, therefore, likely to be proportionately affected in succeeding years. A row lightly infested may occur alongside one quite badly infested where the varieties and cultural conditions are the same. The results of experiments with borer repellant considered on the basis of the actual number of borers found after treatment are not complete unless a previous record of infestation has been made. Trees should be examined twice for borers, the examinations to be made a few days apart so that any borers that are overlooked the first time can be discovered at the second examination by the fresh 'sawdust'."

White grubs or larvæ of the May beetle in greenhouse soils, M. A. Blake and C. H. Connors (*New Jersey Stas. Rpt. 1914, pp. 36, 37*).—In treating compost soil for the destruction of May beetle larvæ or white grubs the authors found that applications to the soil of formaldehyde at the strength of 1:75 with a sprinkling can as the soil is being turned with a fork will kill about 50 per cent of the grubs after a few hours' exposure. At this strength and at the rate of 1:50 most of the medium-sized larvæ are killed, but the large and small-sized larvæ remain alive.

Woolly aphid of elm and Juneberry (Schizoneura americana in part, of authors), Edith M. Patch (*Maine Sta. Bul. 241 (1915), pp. 197–204, figs. 2*).—The author calls attention to the fact that American entomologists have commonly applied the name *S. americana* to two distinct species of plant lice. The first of the two species, which inhabits the leaf cluster or aphid rosette of the American elm, from which it migrates to apple, several varieties of mountain ash (*Pyrus* sp.), and hawthorn (Cratægus), has previously been reported upon and figured by the author (E. S. R., 30, p. 548) as *S. lanigera* and later by Baker (E. S. R., 32, p. 848) as *Eriosoma* (*S.*) *lanigera*. The second of the two

species to which the name *S. americana* has been commonly applied, and which curls or rolls elm leaves, is the one considered in the present bulletin. "Since the name *lanigera* takes care of the rosette species on elm as well as on apple, *S. americana* seems to be left free for the aphid curling or rolling the leaf of the American elm. Riley's description of the leaf deformations caused by *S. americana* seems to indicate clearly enough that he originally applied this name to both these species as his successors have certainly done until recently; and the synonymy '*Schizoneura lanigera* (*americana* in part, of authors)' correctly designates the 'rosette aphid' of the elm."

The present paper outlines the chief points in the life cycle of the second or "rolling aphid." The author finds that when spring migrants leave the elm leaf which has furnished sap for their development they are led to Juneberry (Amelanchier) which is common in Maine. When the migrant reaches one of these bushes it settles upon a leaf and soon afterwards creeps to the underside where it remains quietly, ordinarily for the rest of its life. Before many hours it begins to give birth to young and continues this process for several days. These young soon walk down the stem of the plant and later arrive on the underground stems of the Juneberry where they settle in groups. This becomes the summer residence of the species. In the fall a generation of winged females is developed among the underground forms and these, the fall migrants, leave the Juneberry and take flight to the American elm.

Among the several predaceous insects which frequent the elm leaf curls of this aphidid mention is made of a capsid (*Camptobrochis nitens*), a coccinellid larva, and syrphus maggots. In regard to control measures the author states that where the Juneberry is planted for park or ornamental purposes within aphidid flight of American elm, it would seem desirable to try drenching the soil at the base of the shrub with blackleaf 40 or other good tobacco decoction. Phobably once about mid-July and again late in the month would be the most favorable time for this treatment as the colonies would be young and susceptible and likely to be nearer the surface than later in the season. Young elms can be protected by spring sprays of tobacco decoction before the leaves become curled. Where large power sprayers are available old elms sprayed with drive nozzles could probably be cleaned of most of the infestation. Dormant sprays of lime-sulphur heavily coating the elm bark should be tested as to their efficiency in killing the overwintering egg.

The San José scale (Aspidiotus perniciosus), P. A. Glenn (*Illinois Sta. Circ. 180* (*1915*), *pp. 5–24, pls. 4, figs. 2*).—This is a general account of the origin and distribution, life history and appearance, food plants, and means of distribution and of control.

Mealy bugs of citrus trees, C. P. Clausen (*California Sta. Bul. 258* (*1915*), *pp. 19–48, figs. 8*).—Accounts are here given of four of the important mealy bugs which feed upon citrus trees in Southern California, namely, *Pseudococcus citri, P. bakeri, P. citrophilus,* and *P. longispinus.* The injury inflicted has resulted in a considerable loss of fruit and in an extensive dropping of foliage. By far the greatest amount of injury is caused by the common mealy bug (*P. citri*). An infestation at Uplands, Cal., was found to be caused by a species now designated as the citrophilus mealy bug (*P. citrophilus*).

"The life history during the summer covers approximately two months, the egg stage requiring 8 to 10 days and the nymphal stages a total of about 50 days. Maximum numbers are ordinarily found upon the trees during the early spring and late fall months. The spread from one grove to another is effected upon picking boxes, pickers' clothing, cultivating tools, by birds, etc. Parasites at the present time are not very effective in mealy bug control, and their work

should not be relied upon to the exclusion of artificial control methods where the infestation is serious. Fumigation with hydrocyanic acid gas is not to be recommended. The citrophilus mealy bug is more resistant to hydrocyanic acid gas than any of the three other species. Spraying with water under high pressure, using the M. A. C. nozzle, is the most effective means of control, and when thoroughly done gives a considerable degree of success. Treatment should be repeated whenever the injury produced by the insect becomes sufficient to warrant the expense."

Boll weevil control by cotton stalk destruction, W. E. HINDS (*Alabama Col. Sta. Circ. 33 (1915), pp. 42–47, figs. 2*).—This circular emphasizes the importance of cotton stalk destruction in the early fall and suggests methods of accomplishing it, including a description and plan of an A-shaped cotton stalk cutter, as given by Newell and Dougherty.[a]

The grass worm or fall army worm (Laphygma frugiperda), W. E. HINDS and J. A. DEW (*Alabama Col. Sta. Bul. 186 (1915), pp. 61–92, pls. 4, fig. 1*).—This is a detailed report of studies of the life history, habits, and control of *L. frugiperda*, a résumé of observations of which by Dew has been previously noted (E. S. R., 29, p. 655).

"In southern Alabama the life cycle required an average period of about 30 days. The various stages averaged as follows: Egg, 3 days; larva, 14 days; pupa, 10 days; adult life to include oviposition, 3 days. . . . Hibernation appears to occur in Alabama, principally at least, in the pupal stage. No other hibernating stage was found. . . . Only a small percentage (possibly not over 10 to 20 per cent) of the eggs of dipterous parasites produce parasitism among the worms. Most of them are shed with the larval skins before hatching. In Alabama, in 1912, parasitic species of Sarcophagidæ were more numerous and beneficial than the Tachinidæ. Egg parasites were comparatively rare. . . .

"In cultural control the most effective practice was found to be light, shallow cultivation during the pupal period. A single harrowing destroyed from 35 to 50 per cent of the pupæ. Where the worms destroy field crops in August the best practice would seem to be to plow under the remains of the crop and follow with at least three thorough workings with the disk harrow during a period of 10 to 15 days, then replant to any fall crop or cover crop desired. . . . Among the arsenical poisons, the best results were obtained from arsenate of lead and arsenite of zinc, both applied as sprays."

FOODS—HUMAN NUTRITION.

Meat flour, F. BAUMANN (*Konserv. Ztg., 16 (1915), Nos. 25, pp. 97, 98; 26, pp. 101, 102; 27, pp. 105, 106*).—In this summary and digest of experimental data the author describes the method of preparation and the properties of flour made by drying and milling lean meat. The fact is emphasized that it is necessary to use meat containing as little fat as possible, as the best safeguard against rancidity, and to remove most of the water. In addition, it has been found advisable to use about 3 per cent of sodium chlorid as a preservative. Meat flour prepared in this way is said to possess a good odor and taste; due to its high protein content it is a valuable food; and it is also well digested.

The putrefaction of prepared meat, game, wild fowl, and fish, WEICHEL (*Arch. Wiss. u. Prakt. Tierheilk., 41 (1915), No. 4–5, pp. 322–372*).—In this summary and digest of experimental data very complete information is given as to the underlying causes and conditions of the decay of different kinds of

[a] Crop Pest Com. La. Circ. 30 (1909).

animal foods. A very extensive bibliography is appended containing almost entirely German and French references.

Some physiologic and biochemic observations on milk, W. T. Carstarphen (*Va. Med. Semi-Mo., 20 (1915), No. 13, pp. 319–326*).—This article is a summary and digest of recent experimental data regarding the nutritive value of milk. The work reviewed has to do chiefly with the lime, iron, and phosphorus content of milk. A bibliography is appended.

Action of heat upon cane sugar dissolved in cow's milk, P. Lavialle (*Clin. Infant, 12 (1914), No. 6, pp. 167–169; abs. in Ztschr. Kinderheilk., Ref., 8 (1914), No. 3, p. 123*).—Cane sugar added to cows' milk was partially decomposed during the sterilization of the milk. The addition of lactic acid to the milk before sterilization increased the amount of inversion, indicating that the degree of decomposition depended upon the amount of lactic acid formed in the milk before sterilization.

Different kinds of sugar in the diet of children, A. Gismondi (*Pediatria [Naples], 22 (1914), No. 4, pp. 241–254; abs. in Ztschr. Kinderheilk., Ref., 8 (1914), No. 6, p. 282*).—In the opinion of the author, cane, malt, and milk sugars are of unequal value in the nutrition of children, each having useful and harmful actions. He regards a mixture of the three sugars consisting of 40 per cent lactose, 40 per cent saccharose, and 20 per cent maltose as the most suitable for addition to artificial diets.

Beans and similar vegetables as food, Lucile Brewer and Helen Canon (*Cornell Reading Courses, 4 (1915), No. 89, pp. 181–200, figs. 12*).—This pamphlet contains information regarding the nutritive value, digestibility, and relative cost of legumes as food. Cooking hints and several recipes are also given, and a short bibliography concludes the publication.

Dropsy and anemia on exclusive potato diet, O. Strauss (*Med. Klinik, 11 (1915), No. 31, pp. 854–856; abs. in Jour. Amer. Med. Assoc., 65 (1915), No. 12, p. 1063*).—The author reports a clinical study of a number of cases of disease observed in Poland among people who had subsisted upon practically nothing but potatoes for several months. The symptoms, which suggested heart disease and dropsy, disappeared with the provision of better nourishment and improved hygienic surroundings. These observations indicate, in the opinion of the author, that a one-sided potato diet is unable to protect against the dangers of inanition.

The significance of solanin as a potato poison, Droste (*Pharm. Zentralhalle, 65 (1915), No. 26, pp. 311, 312*).—A summary and digest of experimental data from which the author concludes that the amount of solanin developed in potatoes under ordinary conditions is never sufficient to produce potato poisoning. When solanin is present about 70 per cent is found in the parings. It is the author's opinion that the action of yeast and bacteria in potatoes is responsible for so-called "potato poisoning."

The use of hay flour in the nutrition of animals and men, F. Oetken (*Wiener Landw. Ztg., 65 (1915), No. 42, p. 338*).—Analytical data are given comparing the percentages of digestible nutrients obtained from barley, wheat, and rye flour; oat and rye straw; and alfalfa and red clover hay.

Lichens as a food for animals and man, F. Tobler (*Naturwissenschaften, 3 (1915), No. 28, pp. 365–367*).—A summary and digest of data regarding the preparation and possible uses of lichens for food purposes.

Investigations of yeast as a food, M. Schottelius (*Deut. Med. Wchnschr., 41 (1915), No. 28, pp. 817–819*).—The author reports a series of feeding experiments with nine normal men, who were given increasing amounts of yeast in a simple mixed diet. The subjects receiving the yeast were well nourished

and gained in weight. The conclusion is drawn that a small addition of yeast (25 to 30 gm.) to the ordinary mixed diet is a desirable means of increasing its nutritive value.

The utilization by the animal organism of yeast cultivated in solutions of sugar and inorganic salts, W. Völk (*Ztschr. Spiritusindus., 38 (1915), No. 26, pp. 235, 236*).—Analytical data are given showing the composition of yeast grown in a solution of sugar and inorganic salts. Feeding experiments with a dog are also described, the results of which indicated that the coefficients of digestibility for protein, fat, and carbohydrate were 85, 34.1, and 54.5 per cent, respectively. The author concludes from these data that artificially cultivated and brewery yeasts are equally valuable food materials and may be used occasionally to replace meat in the diet.

The digestibility of yeast, A. Loewy and von der Heide (*Berlin Klin. Wchnschr., 52 (1915), No. 23, pp. 600, 601*).—Metabolism experiments of seven days' duration are reported in which each of the subjects (men) received 100 gm. of yeast per day as a part of a simple mixed diet. Of the 79.35 gm. of protein in the diet 31.69 gm. were furnished by the yeast and the remainder by the meat, cakes, and potatoes, which formed the other ingredients of the ration. The digestibility of the yeast protein for the first four days of the experiment was estimated to be 81 per cent, and for the last three days, 85 per cent.

A bacteriological study of retail ice cream, S. H. Ayers and W. T. Johnson, Jr. (*U. S. Dept. Agr. Bul. 303 (1915), pp. 24, figs. 4*).—The investigation reported in this bulletin forms the first part of a study of the bacteria of ice cream. The following problems were investigated: The number of bacteria in commercial ice cream during the summer and winter months; the determination of the groups of bacteria found in commercial ice cream; and a study of the relative value of several different methods for the determination of *Bacillus coli* in ice cream. Samples of ice cream representing 24 different manufacturers were purchased at retail stores throughout the city of Washington, and represented the ice cream as it is received by the consumer. Samples were collected in both the summer and winter months.

Examination of 65 samples of vanilla ice cream showed that their average acidity was 0.206 per cent, calculated as lactic acid. No relation was found to exist between the acidity of the samples and their bacterial content.

The 94 samples of ice cream collected during the summer months showed an average bacterial content of 37,859,907 per cubic centimeter, and the 91 samples examined during the winter months showed an average bacterial content of 10,388,222. None of the summer samples contained less than 100,000 bacteria, but the bacterial content of 14.28 per cent of the winter samples fell below this figure.

Employing the "milk-tube method," the bacteria in 71 summer samples and in 28 winter samples were divided into general groups of acid-coagulating, acid-forming, inert, alkali-forming, and peptonizing organisms. The results of the bacteriological examination are presented in detail and discussed extensively. The authors state that "the bacterial groups bore much the same relation to each other in the average summer and winter samples. There was, however, in the summer samples a higher percentage of the acid-coagulating group of bacteria and a lower percentage of the alkali and peptonizing groups than in the winter samples." It was found that there was a higher percentage of rapid acid-coagulating bacteria in ice cream during the summer months. In the summer samples, 52.81 per cent of the bacteria of the acid-coagulating group, and in the winter samples 26.69 per cent, were active enough to coagulate milk in 48 hours when incubated at 30° C. The average number of peptonizing bacteria

found during the winter season was about one-fifth of the number found during the summer.

Gas-forming bacteria of the colon-aerogenes group when determined on litmus-lactose-asparagin agar were found present in 0.1 cc. in 106 of the 120 samples examined. "Of the 14 negative samples, 13 were of the winter series and 1 was examined during October. The average number of gas formers in the entire series of samples was 16,298 per cubic centimeter. Fifty-seven samples examined during the summer averaged 29,544 per cubic centimeter. The 49 winter samples contained an average of 889 per cubic centimeter. Ice cream contained a much larger number of gas-forming organisms during the summer season. A large number of media were used in an attempt to devise a suitable medium for the detection of *Bacillus coli* in ice cream, and our results show that there is no entirely satisfactory method known at present."

The useful and harmful constituents in coffee, H. FREUND (*Pharm. Zentralhalle, 56 (1915), No. 28, pp. 343-348, fig. 1*).—A summary and digest of experimental data treating of the comparative composition of coffee prepared by several different commercial methods.

Efficiency of coffee-making devices, R. F. BACON (*Tea and Coffee Trade Jour., 29 (1915), No. 5, pp. 427-429*).—This article reports the results of a study of the comparative efficiency of nine commercial coffee-making devices. Data are given showing the percentage of caffetannic acid and caffein in the brews. together with the number of grains of caffein contained in one average-size cup of each brew.

The caffein content of Java tea, J. J. B. DEUSS (*Chem. Weekbl., 12 (1915), No. 42, pp. 938-943*).—Comparative analytical data are reported showing the amount of caffein contained in a number of commercial brands of tea. The minimum quantity in a good grade of Java tea is given as about 3 per cent.

Spices, J. K. JANK (*St. Louis: Author, 1915, pp. 121*).—This book, which is intended for manufacturers, grocers, etc., contains information regarding the botanical origin, geographical source, commercial use, and chemical composition of the principal spices. The federal standards for each spice are given and the common commercial grades are described. The more common seeds, herbs, leaves, etc., are treated in a similar way. A large amount of miscellaneous information, including federal and state laws on labeling, net weights, etc., is also given.

Nonalcoholic carbonated beverages, sanitary condition and composition, R. M. ALLEN, J. O. LA BACH, W. R. PINNELL, and L. A. BROWN (*Kentucky Sta. Bul. 192 (1915), pp. 59-125*).—This bulletin presents the results of a sanitary survey of the soft-drink industry of the State in which the methods employed were similar to those developed in milk inspection.

Sanitary inspections were made of the plants where these products were prepared, and this included an investigation of the equipment used. Especial attention was given to the methods employed in washing bottles. The necessity for thorough sterilization of the bottles or other containers is emphasized. It is recommended that they be kept in live steam from 30 to 40 minutes and any subsequent contamination guarded against.

Chemical and bacteriological examinations of the water used in the manufacture of soft drinks showed that many of the plants were using water which needed purification by filtration or sterilization.

The results of the bacteriological examination of the soft drinks are presented in detail, and from these results some of the conclusions drawn are that the bacteriological count of the finished product is not a correct index of the sanitary conditions existing in the manufacture of soft drinks, and that

although carbonic-acid gas is antiseptic and germicidal to a considerable extent, it can not be relied upon as a sanitary safeguard since it does not inhibit or kill all micro-organisms.

Data regarding the chemical examination of a number of samples are given in tabular form. An examination of 25 samples of so-called "pops" containing caffein showed the average amount to be 0.8 grain per bottle of 200 cc.

The bulletin also contains a report on the value of Endo medium as a presumptive test for bacteria of the *Bacillus coli* group. The conclusion is drawn that this medium is a very reliable presumptive test for these organisms.

A study of the gelatinizing agents, pasty materials, and thickeners used in food products, L. A. CONGDON (*Trans. Kans. Acad. Sci., 27 (1914), pp. 81–86*).—These substances are considered with reference to their physical and chemical properties and their detection in food materials. Those most commonly used are said to be gelatin, starch, agar-agar, gum tragacanth, dextrin, gum arabic, albumin, and fruit and vegetable pectins. A table is given in which these substances are classified into six groups, with the group reactions for their detection.

[Food and clothing in the United States Navy], S. MCGOWAN (*U. S. Navy Dept., Ann. Rpt. Paymaster Gen., 1915, pp. 5–7*).—Included in this publication is some information regarding the purchase of food supplies, the satisfactory character of the ration, and costs. It appears that for the year 1915 the average daily cost of subsistence per man was 36.038 cts., as compared with 36.648 cts. for 1914. The report also contains some information regarding the United States Navy clothing problem, including the manufacture of garments at the Charleston Navy Yard and elsewhere.

[Progress in] physiological chemistry, F. G. HOPKINS (*Ann. Rpts. Prog. Chem. [London], 11 (1914), pp. 188–212*).—This report contains a summary and digest of the more important experimental data contributed to the science of physiological chemistry during the year 1914. Among the subjects in which progress has been reported are catalysis, the specificity of tissue enzyms, defensive ferments, the metabolism of carbohydrates and fats, the creatin problem, and vitamins.

Differences in the digestion in adults and infants, J. F. MCCLENDON (*Jour. Amer. Med. Assoc., 65 (1915), No. 1, pp. 12–14*).—As a contribution to the knowledge of the conditions under which the digestive enzyms act in the case of both adults and infants, the acidity of the stomach and reaction of the duodenal contents were measured by means of hydrogen electrodes.

After a normal meal, the acidity of the adult stomach was found to reach its maximum in from two to three hours. The rise in acidity was the more rapid the lighter the meal, though the degree of acidity varied with the individual. The duodenal contents proved to be barely alkaline.

As to digestion in infants, the author concludes that "the acidity of the infant's stomach rises slowly after the milk begins to leave it, and four hours after nursing may be the same as some normal adult stomachs. That of the gastric juice of the new-born is 0.005.

"The acidity of the duodenal contents of the infant is 0.0008, and hence it is probable that both peptic and tryptic digestion take place in the intestine of the infant. Pepsin was always found and was apparently more abundant (active) than the trypsin."

The acidity of the infant stomach, R. HESS (*Ztschr. Kinderheilk., 12 (1915), No. 6, Orig., pp. 409–439; abs. in Zentbl. Physiol., 30 (1915), No. 7, pp. 308, 309*).—Examination of the stomach contents of more than 70 infants showed that in the majority of cases too little acid was present during the earlier weeks to permit

of peptic digestion. At the end of nine months the acidity was sufficient for the action of pepsin.

Influence of fat and carbohydrate during protein starvation on the excretion of neutral sulphur in the urine, H. ZELLER and H. STRACZEWSKI (*Arch. Anat. u. Physiol., Physiol. Abt., No. 5–6, (1914), pp. 585–594; abs. in Zentbl. Physiol., 30 (1915), No. 2, p. 96*).—Metabolism experiments with men and dogs showed that the substitution of the carbohydrate of a protein-free diet by fat leads to an increase in the excretion of both nitrogen and neutral sulphur in the urine.

The synthesis of cholesterin, S. DEZANI and F. CATTORETTI (*Arch. Farmacol. Sper. e Sci. Aff., 19 (1915), No. 1, pp. 1–9; abs. in Zentbl. Physiol., 30 (1915), No. 5, pp. 225, 226*).—Feeding experiments here reported showed that laboratory animals (white mice) when fed on a ration free from lipoids, phytosterin, and cholesterin could synthesize cholesterin.

Adiabatic device for bomb calorimeter, J. A. FRIES (*Pennsylvania Sta. Rpt. 1912, pp. 793–801, figs. 1*).—The equipment described, evolved in experiments in cooperation with the Pennsylvania Institute of Animal Nutrition and the Bureau of Animal Industry of this Department, is applicable to any bomb calorimeter of the Atwater-Berthelot type, and in principle is the same as that used in the Atwater-Rosa respiration calorimeter. Experimental data are given showing the efficiency of the apparatus.

ANIMAL PRODUCTION.

Distribution and digestibility of the pentosans of feeds, G. S. FRAPS (*Texas Sta. Bul. 175 (1915), pp. 5–24*).—In these experiments the samples used were the feeds and excrements from the digestion experiments previously reported (E. S. R., 27, p. 668).

It was found that legumes contain a much lower percentage of pentosans than nonlegumes. Approximately 28 per cent of the pentosans of nonlegumes is in the crude fiber, 44.5 per cent is dissolved by fiftieth-normal acid and alkali, 2.2 per cent is dissolved by 1.25 per cent sulphuric acid, and 26.7 per cent, by 1.25 per cent alkali. On an average 18.8 per cent of the pentosans of nonlegumes are in the crude fiber, 24.8 per cent dissolved by fiftieth-normal acid and alkali, 26.9 per cent dissolved by 1.25 per cent sulphuric acid, and 29.5 per cent dsisolved by 1.25 per cent alkali.

"The total pentosans of the legumes were on an average digested better than the pentosans of nonlegumes, though there were several nonlegumes fully up to the average for legumes. The pentosans soluble in fiftieth-normal acid and alkali are digested to a greater extent than the remaining pentosans. Those of legumes are on an average considerably more digestible than those of nonlegumes. Pentosans in crude fiber are apparently digested to a greater extent than those soluble in 1.25 per cent sulphuric acid or 1.25 per cent caustic soda. This may be due to digestive processes rendering crude fiber more soluble in acid or alkali, and thus throwing a portion of it into the nitrogen-free extract group. Pentosans are destroyed by digestion with hot fiftieth-normal acid or alkali, or stronger solutions. The alkali is somewhat more destructive than the acid, but the losses are nearly the same with the stronger or weaker reagent, being about 10 per cent. The 'pentosans' which are destroyed by boiling with acid or alkali may be the same substances (furaloids) which give rise to the substances in the hydrochloric acid distillate, which are destroyed by a redistillation."

Feeding stuffs inspection and analysis, 1915, B. E. CURRY and T. O. SMITH (*New Hampshire Sta. Bul. 175 (1915), pp. 23*).—Analyses are given of the following feeding stuffs: Bran, middlings, red dog flour, wheat screenings, cotton-

seed meal, hominy meal, dried beet pulp and molasses, molasses meal, cut clover, alfalfa meal, alfalfa, dried beet pulp, brewers' and distillers' grains, gluten feed, linseed oil meal, provender, meat scrap, meat meal, fish scrap, beef scrap, and various mixed and proprietary feeds.

The Kansas feeding stuffs law, revision of 1913; amended 1915 (*Kansas Sta. Circ. 52* (*1915*), *pp. 10*).—An account of the Kansas feeding stuffs law, as amended in 1915, together with a table giving the minimum, maximum, and average protein, fat, and crude fiber content of the following feeding stuffs: Wheat bran, wheat bran and screenings, wheat bran and scourings, corn bran, standard shorts, shorts and screenings, shorts and scourings, brown shorts, brown shorts and screenings, white shorts, white shorts and screenings, wheat mixed feed, wheat mixed feed and screenings, corn chop, corn chop and corn bran, Kafir corn chop, milo maize chop, barley chop, alfalfa meal, hominy feed, linseed meal, cotton-seed meal, cotton-seed cake, and cold-pressed cotton seed.

Kansas live stock remedy law, with list of remedies registered April 1, 1915 (*Kansas Sta. Circ. 50* (*1915*), *pp. 15*).—An account of the law of 1913 relating to the manufacture and sale of medicinal stock foods and remedies, together with a list of ingredients commonly contained in these remedies and the firms registering live-stock remedies in the State.

A system of pasturing alfalfa in Salt River Valley, Arizona, R. W. CLOTHIER (*U. S. Dept. Agr., Office Sec. Circ. 54* (*1915*), *pp. 4*).—A system of rotation pasturing of alfalfa in use in Arizona is described.

One farm is a dairy and stock farm of 160 acres, all in alfalfa. It is divided into 8 fields of 20 acres each. All of these fields are pastured more or less at different times during the year, but occasionally the crop is cut for hay instead of being pastured off. When pastured a field is first opened to dairy cows giving milk. When they have secured the best of the feed they are put into a new field, and dry cows and young stock are turned in to clean up the feed left by the milch cows. When this has been done all the stock is taken off the field, which is watered and not pastured again until another crop has matured. When a field is cut for hay the crop is put up quickly with a hay loader, and dry cows and young stock are turned in to clean up waste hay. The field is then watered and all stock kept off until another crop is ready to harvest. By this system the farmer keeps the equivalent of 168 full-grown cattle on his farm for 12 months and has 360 tons of surplus feed. This is sold when prices are high and when prices are low it is fed to fattening steers not included in the above enumeration of animals kept on the farm. The stand of alfalfa has been maintained in excellent condition for 10 years.

On another farm the live stock consists of matured steers and mules. The crop enterprises are the production of alfalfa hay and alfalfa seed. There are 140 acres of alfalfa divided into five fields, two of 18 acres each, two of 40 acres each, and one of 24 acres. By following the rotation system of pasturing described above these fields were made to furnish 261 days of pasturage to the equivalent of 139 mature cattle, and in addition they produced 247 tons of hay, 10,000 lbs. of alfalfa seed, and 50 tons of alfalfa straw. The farm maintained the equivalent of 141 full-grown animals for 12 months and produced a surplus of hay and seed which sold for $1,860. On this farm the stand of alfalfa is being maintained.

The associative digestibility of corn silage, cotton-seed meal, and starch in steer rations, P. V. EWING and C. A. WELLS (*Georgia Sta. Bul. 115* (*1915*), *pp. 269–295, figs. 7*).—This bulletin reports the results of a series of investigations to determine the influence of one ingredient of a ration on the digestibility of the other ingredients of the ration. The feeds used were corn silage, cotton-seed meal, and corn starch. Studies were made on nine distinct rations, com-

pounded as follows, in percentages of net thermal energy values (not weights): Ration 1, silage, cotton-seed meal, and starch, 100:0:0; ration 2, 0:100:0; ration 3, 10:30:0; ration 4, 50:50:0; ration 5, 34.5:34.5:31; ration 6, 69:0:31; ration 7, 30:70:0; ration 8, 15.8:36.9:47.3; ration 9, 52.7:0:47.3. High-grade yearling Shorthorn steers were used, and the digestion trials were of 10 days' duration with a suitable interim between each trial.

It was found that starch, when fed in excessive amounts, seemed to exert a depressing effect upon the digestibility of the nitrogen and crude fiber, even when the excess was not great. When 47.3 per cent of the net energy of the ration was supplied in the form of starch there was also a depression in the digestibility of the total ash. These depressions in digestion of nitrogen, crude fiber, and ash were accompanied by a rise in the digestion of fat, which was quite noticeable in the high starch rations. The depression in the digestibility of the several nutrients brought about by the addition of starch was largely overcome, and in some instances completely overcome by the addition of cotton-seed meal, even though the quantity of starch remained constant. Increasing the quantity of crude fiber in the ration did not exert a depressing effect upon the digestibility of the nitrogen-free extract, but tended rather to increase the percentage of nitrogen-free extract digested.

The variability of the results from different steers, due either to the individuality of the animals or to the imperfections of the usual methods of conducting metabolism experiments, was so great as to obscure in many cases the variations resulting from the influence of food combinations. The nearer the rations approached what is generally considered a normal ration, such as a ration in which 70 per cent of the net energy is supplied in the form of silage and 30 per cent in the form of cotton-seed meal, the smaller were the variations among individuals.

Steers when changed from one ration to another apparently do not at first secure all of the nutriment from the ration that they will secure after they have been on the feed for a time. Especially does this seem to be true when the change is from a rich to a poorer diet. Even when as much as 47.3 per cent of the net energy of the ration was supplied in the form of starch the iodin test did not indicate the presence of starch in the feces. Within certain limits the total quantity of nitrogen excreted by the feces was fairly constant, despite marked changes in the nitrogen intake and digestibility. A 200-kg. steer will excrete by the feces as much as 5.84 gm. daily of metabolic nitrogen for a considerable period (25 days).

The figures obtained relative to the actual coefficients of digestion, as compared with the calculated, so far as the silage and cotton-seed meal rations are concerned, indicate that for most nutrients a fair degree of reliability can be placed upon the calculated coefficients of digestion. For the dry matter the variation was never over 5 per cent; for the nitrogen, never over 7 per cent; for the crude fiber, never over 10 per cent; for the fat, never over 14 per cent; and for the ash, never over 30 per cent. In the case of the silage and cotton-seed meal rations, modified by the addition of starch, much less reliability could be placed upon the calculated coefficients of digestion. For the dry matter the variations amounted to as much as 20 per cent; for the ash, 35 per cent; for the nitrogen, 73 per cent; for the crude fiber, 45 per cent; for the nitrogen-free extract, 15 per cent; and for the fat, 55 per cent.

Cotton-seed cake vs. cold-pressed cotton-seed cake for beef cows. Mixed grain vs. cotton-seed cake for growing beef cattle, A. D. FAVILLE (*Wyoming Sta. Bul. 106* (*1915*), *pp. 11*).—In part 1 of this bulletin it is shown that in an experiment with two lots of four beef cows each 2.4 lbs. of cotton-seed cake,

when fed with native hay, was practically equal in feeding value to 3 lbs. of cold-pressed cake. Part 2 treats of an experiment with two lots of four beef heifers each, fed 141 days, in which it was found that a ration of 4 lbs. of a mixture of equal parts of corn meal and mill-run bran gave better gains than did 2 lbs. of cotton-seed cake. The economy of gains depended upon the relative cost of feeds.

The maintenance of a beef-breeding herd, W. H. TOMHAVE and B. O. SEVERSON (*Pennsylvania Sta. Rpt. 1913, pp. 107–134, pls. 4*).—This is a continuation of work previously noted (E. S. R., 28, p. 266).

In this experiment the two lots of ten cows each were wintered from November 15, 1912, to April 25, 1913, in an open shed and fed a ration composed of corn silage and cotton-seed meal, corn silage being fed to meet the appetite of the cows and cotton-seed meal at the rate of 1 lb. daily per cow. Lot 1 (Shorthorn cows) made a total gain during the period of 11.9 lbs. per head; lot 2 (Aberdeen-Angus cows), 36.6 lbs. per head. The two lots consumed the same total amount of feed, approximately 9,600 lbs. of corn silage and 161 lbs. of cotton-seed meal per head, which cost $19.32 per head. The cost of bedding was estimated at $4.52, the labor cost in feeding $2.50, and the value of manure $7.60 per head, making the net cost of wintering a cow $18.73. The average daily gain made per head by the Shorthorn calves from these cows was 1.56 lbs. and by the Aberdeen-Angus calves 1.41 lbs., or an average of 1.47 lbs., which cost, per pound of gain, 4.11 cts.

Maintenance rations for breeding flocks of mutton and wool sheep, B. O. SEVERSON (*Pennsylvania Sta. Rpt. 1912, pp. 149–177*).—Four lots of 10 ewes each, lots 1 and 2 being composed of Shropshires and lots 3 and 4 of Delaine-Merinos, were fed for 20 weeks. Lots 1 and 3 received a roughage ration consisting of corn silage supplemented with cotton-seed meal. The silage was fed twice daily in accordance with appetite, while the cotton-seed meal was fed at the rate of 1 lb. per 25 lbs. of silage. The grain mixture was composed of shelled corn, oats, wheat bran, and linseed meal 5 : 3 : 2 : 1 : This mixture was fed at such times and in such amounts as were sufficient to keep the ewes in good breeding condition. Lots 2 and 4 were fed a roughage ration composed of corn silage fed in the evening and alfalfa fed in the morning. The amount of each was governed by appetite. The grain mixture was similar to the mixture fed lots 1 and 3. Analyses of the feeds are reported.

It was noted that the lots receiving corn silage as the sole roughage made greater gains for the entire period than those also receiving alfalfa. It appears that corn silage with cotton-seed meal as a source of protein was as efficient as corn silage with alfalfa hay as a source of protein. The average gains per head of breeding ewes for the period were: 9.054, —1.119, 11.546, and —1.563 lbs. for the respective lots.

Comparing the lots fed silage and those fed alfalfa and silage, the greatest losses during lambing time were with the latter. The Shropshires were affected by more variation in weight than the Delaine-Merino lots. This is said to substantiate the old version that "Merino sheep, though not as easily placed in high condition of flesh, will retain their condition with greater persistence than mutton sheep."

The air-dry matter consumed by lots 2 and 4 in the form of alfalfa hay remained practically uniform and identical in both lots. A lesser amount of air-dry matter was consumed by both lots in the form of corn silage than in the form of alfalfa hay. In lot 2 the amount of air-dry matter in the corn silage consumed gradually decreased with the advance of the feeding period. In lot 4 the amount was practically constant, decreasing slightly with the advance of the

experiment. This serves to indicate that the amount of corn silage consumed by breeding ewes decreases with prolonged feeding and that alfalfa hay will remain practically constant when both are fed as roughage in the same ration. The total amount of air-dry matter consumed by breeding ewes was greatest with lots fed alfalfa hay and corn silage as roughage. Due to greater weight and size, the Shropshire consumed more air-dry matter than the Delaine-Merino ewes. The consumption of air-dry matter per 100 lbs. of live weight was also slightly less with the Delaine-Merino ewes receiving corn silage as roughage than the Shropshire consuming the same ration. From these data it appears that the Delaine-Merino breeding ewes or wool sheep require more air-dry matter per unit weight than mutton-type Shropshire ewes.

The cost of feeding the ewes in all lots increased with the addition of grain and commercial feeds. Lot 1, receiving corn silage alone as a roughage, had a daily cost of 2.282 cts. per ewe and 1.72 cts. per 100 lbs. of live weight during the period. Lot 2, receiving alfalfa hay and corn silage as roughages, had an average daily cost of 2.933 cts. per ewe and 2.264 cts. per 100 lbs. of live weight. The same correlation was obtained with the costs of feeds fed the Delaine-Merino sheep. The average cost per ewe was 1.959 cts. daily in lot 3 and 2.698 cts. in lot 4, and per 100 lbs. of live weight the cost was 1.851 cts. daily in lot 3 and 2.641 cts. in lot 4. The cost of maintaining the Delaine-Merino ewes was less than that of the Shropshire ewes because of the greater size and feed capacity of the Shropshire sheep. However, the cost of feed fed per unit weight was less with the Shropshire than with the Delaine-Merino ewes.

A study was made on the effect of rations fed, the behavior of the ewes and lambs, the percentage of lambs raised in each lot, the development of lambs after birth until they reach eight weeks of age, the condition of the ewes, the sex of lambs, and the feed consumed by the lambs.

Comparing the two Shropshire lots 1 and 2 with the two Delaine-Merino lots 3 and 4, the average weight of ewes and lambs was greater with the former. The Shropshire ewes averaged 131 lbs. and the Delaine-Merino ewes 102.16 lbs. at the time of weaning. The Shropshire lambs averaged 9.42 lbs. and the Delaine-Merino lambs 8.52 lbs. The Shropshire ram lambs averaged 10.58 lbs. and the ewe lambs 8.88 lbs.

The lambs in lot 1 consumed the greatest amount of air-dry matter per head daily. In lots 3 and 4 the amount consumed was practically identical. The Shropshire lambs consumed more grain than the Delaine-Merino lambs. The average weight of ram lambs in the Shropshire lots at the end of eight weeks was 35.2 lbs. and of Shropshire ewe lambs 28.59 lbs. The ram lambs in the Delaine-Merino lots averaged 29.25 lbs. at the end of eight weeks, while the ewe lambs weighed 28.25 lbs. The Shropshire and Delaine-Merino ewes fed corn silage supplemented with cotton-seed meal had heavier lambs than ewes of the same breed receiving corn silage and alfalfa hay as roughage.

In a study made of the production and value of wool by the breeding ewes, there appeared to be a greater amount of yolk or oil in the fleeces of the lots receiving corn silage alone as roughage. Unwashed Shropshire fleeces brought more per pound than the Delaine-Merino fleeces. The average weight of the fleeces was 6.799, 6.123, 12.587, and 11.386 lbs. for the respective lots.

The author states that this investigation is still in progress and that a duplication is deemed necessary to justify definite conclusions.

Report of the animal husbandman (*New Jersey Stas. Rpt. 1914, pp. 85–98, pls. 2*).—A 4-acre plat of rape, soy beans, and sweet clover pastured an equivalent of 60 days by 30 spring pigs produced, deducting gains made by corn, 1,854 lbs. of pork. It was observed that the pigs preferred the bean forage and that

the rape was next in palatability. A 2-acre plat seeded with rye in November and pastured during the winter, seeded to corn and soy beans in June and in August broadcasted with rape and rye, and pastured during the summer, produced 776 lbs. of pork. A 3-acre tract seeded with rye and vetch in November, with corn and soy beans in May, rape and soy beans in August, and pastured during the spring and fall produced a total of 1,461 lbs. of pork. A mixture of rape and sweet clover proved especially attractive to pigs, it being preferred to alfalfa.

The number of sows and their litters that can be pastured on alfalfa with safety throughout the year was found to be five per acre, provided they are given a liberal grain ration dur'ng the time when they are nursing the pigs. The most rapid and economical gains resulted in the case of two Duroc sows that were fed ear corn with 10 per cent of tankage while grazing on alfalfa forage. The pigs responded to this ration and made more than 1 lb. of gain per day throughout the season. On a basis of net gain per acre, i. e., after deducting the cost of feed consumed and calculating pork at 10 cts. per pound live weight, the alfalfa fields, now six years old, produced a net profit of $41 per acre in 1914. It is concluded that swine are able to market alfalfa in the form of pork at a profit unequaled by any other method of handling this crop.

Of a number of pigs sold to a hog cholera serum laboratory, certain pigs proved noticeably resistant to the disease when injected with the virus. It was found that the hardiest and most resistant pigs were farrowed from sows that had been housed in the open, with only the protection afforded by the colony houses. Other pigs which had been pen raised and had not been given free range nor fed on a forage crop reacted shortly after an injection of the virus.

Pigs given a mineral mixture of charcoal, salt, bone meal, air-slaked lime, gentian, sulphur, and ferrous sulphate did not root, whereas pigs not receiving this mixture did root.

Trials with the colony-house system of wintering brood sows proved very satisfactory. The sows were hardy and the litters large and healthy. It was found that the best pigs could be traced to the brood sows giving the most milk, and that sows farrowing in good flesh were the heaviest milkers. To this end the grain ration was increased after the sow or gilt was safely settled, say 45 days after mating. At farrowing time the sows were all in good flesh and bloom. The corn and alfalfa ration was supplemented with some bran and tankage during the five weeks preceding farrowing. The corn was taken away, entirely two weeks before parturition and the amount of feed increased in bulk by the use of pulped roots and alfalfa leaves. The sows were again placed on full feed (all they would eat and clean up with relish) when the pigs were four weeks old. An attempt was made to combine the feeding of alfalfa hay after farrowing, but it proved too bulky and the sows lost flesh and failed to give a satisfactory flow of milk. Green rye gave much better results than the alfalfa hay, apparently because of its succulent properties.

Trials previously noted (E. S. R., 32, p. 569) were continued to determine a method whereby the refuse product known as garbage tankage or "stick" could be safely fed to pigs. It was found that two methods of neutralizing the acidity were practical, one being the use of lime water, and the other material used being ground limestone. The product varied materially in its composition both chemically and mechanically, and for this reason it is not deemed possible to give a definite formula governing the amount of these materials required for neutralization. A mixture made up of corn meal, stick, and blackstrap molasses 4 : 8 : 3, together with a small amount of red dog flour, was fed to pigs for 96 days, producing an average daily gain of 1.656 lbs. per pig. This mixture

proved its usefulness in fattening old sows for market. In its present form the stick is too bulky, and it is suggested that it be dried and distributed in the form of powder.

In a lot of pigs fed corn and digester tankage with skim milk, the gains cost 10 cts. per pound as compared with 3.76, 4.99, 5.99, and 4.6 cts. in lots where the stick was used, but these results are not deemed conclusive.

Rape for fall pigs, C. K. McClelland and P. V. Ewing (*Georgia Sta. Circ. 73 (1915), pp. 4, fig. 1*).—General information on the value of rape for fall pigs based on station work is summarized. Pigs fed on rape pasture averaged from 25 to 33⅓ per cent larger than when fed in a dry lot. The loss of pigs to weaning age was also reduced by the use of this pasture from 20 to 25 per cent to less than 6 per cent. On fall-planted rape from 14 to 21 hogs per acre were grazed from October 28 to April 7.

Growing and fattening hogs in Montana, P. N. Flint and R. F. Miller (*Montana Sta. Circ. 50 (1915), pp. 43–71, figs. 2*).—General information is given on methods of growing and fattening hogs under Montana conditions. An article by H. Welch on diseases of swine is appended.

[Changes in form due to fattening of horses], W. A. Cochel and B. O. Severson (*Pennsylvania Sta. Rpt. 1912, pp. 134–140, figs. 5*).—This reports measurements taken of the fattening horses used in the experiment previously noted (E. S. R., 28, p. 171).

A record of the outline of the chest and the middle of the paunch of each individual horse was made at the beginning and close of the experiment by means of an adjustable chain, for the purpose of determining where the fat was placed on the body. It was found that there was little change in depth of body, especially at the heart girth; that there was an apparent improvement in the spring of the rib and a very material increase in the width of the body throughout. It appeared that the greatest changes in form due to the fattening process are in those parts of the body where there is the heaviest covering of muscle. A very marked change in the form of the chest was noted in the location of the point of greatest width, which is nearly 2 in. higher in the fat animal than in the one in thin condition. There was a smoothness in outline and rotundity of form after fattening entirely absent before the finishing process is started. In the outlines of the middle of the paunch of thin horses there was a flattened appearance above the median line, while the same measurements after fattening resulted in an almost perfect circle.

As the horses lost in weight and condition, due to work, they assumed a form similar to that which they had before the fattening period. These changes show that the horse at hard work may not only utilize his daily rations for the production of work but may draw upon the reserve energy which is stored up in the form of fat on his body. There was very little change in the length of head and shoulder and the distance from the chest and hock to the ground. The length of back as measured from the scapula to the hip decreased slightly, due to a deposit of fat over the hips and immediately behind the scapula; there was an apparent lowering of the hind flank. The losses in these two measurements, however, were so slight as to be within probable error of measurements. There was an increase in height both at the withers and croup. At the beginning the horses were higher at the withers, but when finished were higher at the croup, probably due to the deposit of fat within the heavy muscles over the hips.

The results of these measurements seem to indicate that the greatest change in fattening horses is one of width rather than depth; that the smoothness, symmetry, and general appearance are greatly improved by the "rounding out" process due to deposit of fat within the muscles and that the form of the indi-

vidual is largely a matter of condition, while the type is almost entirely due to breeding.

Developing draft colts, W. A. Cochel and B. O. Severson (*Pennsylvania Sta. Rpt. 1912, pp. 126–134, pls. 16*).—This is an amplification of work previously noted (E. S. R., 29, p. 773), with additional data on the rate of growth and change in form of draft colts from weaning until two years of age.

Cross-section measurements of the heart and paunch girth were made at intervals of three months from November, 1910, to April, 1912. It appears that the rate of growth as measured by the increase in the length of bones is continuous from birth to maturity, but that the increase in width of body may remain stationary while that in depth increases. This is to a very large extent due to the amount of food that the animal consumes over and above that required for maintenance and growth which is represented by a deposit of fat over the outside of the chest. There was apparently a greater increase in the depth of chest than in the depth at the middle of the paunch, doubtless due to the colts being "paunchy" at the beginning of the feeding period.

Lineal measurements were also taken. It was observed that the height of withers was materially greater at weaning time than that of the croup, while in their 2-year-old form the difference was very much less. The depth of the chest increased 32 per cent during the entire period, while the distance from the chest to the ground only increased 9.78 per cent, showing that the foal is much more "leggy" than the mature horse. There was very little change, amounting to only 1.8 per cent, in length of the cannon of the hind leg as indicated by the measurement from the point of hock to ground. There was a very material increase in the length of shoulder and also in the length of back as measured from the scapula to the hip. In all of the measurements, however, the increase in width was proportionately greater than the increase in height, so that the body may be said to change in both depth and width to a greater extent than in the length of the long bones of the skeleton. There was apparently a much greater increase in the circumference of the girth at the heart than in either of the circumferences at the hind flank or in the middle of the paunch. During the last period, when the grain rations were increased very materially in order to induce fattening, the most noticeable change was in the width of the body throughout. There was practically no additional growth in the depth of the chest or in the length of the cannon during this period. The greatest change was in the rounding out and improvement, in the symmetry, form, and general appearance of the animals rather than any actual change in the form as indicated by the change in skeleton.

Individual characteristics of hens, H. W. Jackson (*Pennsylvania Sta. Rpt. 1912, pp. 228–241, pls. 10*).—Three experiments were conducted to ascertain the difference in individual preference for feed stuffs, and variation in the nutritive ratio preferred by individuals.

It was noted that hens taken from the same general flock and previously fed on the same or similar rations developed pronounced preferences in feeding, preferences which persisted throughout the entire period of observation. One hen, for example, promptly selected a ration of corn, wheat, and scrap, with a very large proportion of corn, and that ration remained characteristic of her throughout the entire year. The proportions varied and on lighter laying in the second season wheat consumption decidedly increased, but her corn preference persisted to the end. Hens that showed an indisposition to consume enough oyster shell properly to inclose the eggs were given 10 grains of powdered oyster shell daily in capsules. The shells resumed their normal strength, thickness, and texture.

Different dry mash mixtures were tried, but there was no apparent preference. With the exception of certain hens, dry mash consumption was very slight regardless of the mixture used. None of the hens showed a particular liking for meat scrap. It was found that the consumption of oyster shell varied with the egg production.

The consumption of grit was small and in practically all cases governed by the season, reaching its height in early winter and dropping to practically nothing in spring and summer, at which time also shell consumption reaches its highest point. Attention is called to the fact that the heaviest grit consumption is at the time when new feathers are being formed and when presumably the greatest demand is being made for mineral elements. While the average consumption of grit by these hens, on a ration consisting mainly of whole grains for an entire year averaged 0.14 oz. per hen per week, cockerels being fattened on a ration of finely ground grains and buttermilk have been found to consume 0.84 oz. weekly per fowl.

The effect of season and production on food consumption, while it seems to be indicated in the records of individuals, gives uncertain results when applied to totals or averages for a number of individuals. The year divides itself into three periods, two laying periods and one nonlaying period. The first period runs from July 6 to October 25, 16 weeks; October 26 to February 28, 18 weeks; and March 1 to July 4, 18 weeks. The average food consumption and performance per week for each hen is given by periods in the following table:

Average food consumption per week per hen for the three seasonal periods.

Period.	Corn.	Oats.	Wheat.	Mash.	Meat scrap.	Total feed.	Oyster shell.	Grit.	No. of eggs.	Weight of hen.
	Oz.	*Oz.*	*Oz.*	*Oz.*	*Oz.*	*Oz.*	*Oz.*	*Oz.*		*Oz.*
July 6 to Oct. 25	8.49	1.71	12.84	1.94	1.14	26.13	0.69	0.13	2.50	4.90
Oct. 26 to Feb. 28	8.76	.87	13.42	1.01	.59	25.11	.32	.23	.32	5.29
Mar. 1 to July 4	6.70	1.72	12.80	1.49	.75	22.98	.92	.02	3.47	5.64

It is seen that though the production of eggs dropped practically to zero during the second period, the food consumption dropped very little as compared with the first period. In the third period egg production was fairly heavy and weight increased; food consumption perceptibly decreased. Apparently, winter conditions make as much of a draft on the fowls as egg production.

All nonproducers were found to be diseased either in the liver or ovary, and it is deemed an interesting point for further observation as to the extent to which nonproduction may be the result of pathological conditions which do not noticeably affect general health for months or even years.

Report of the poultry husbandman, H. R. Lewis and W. C. Thompson (*New Jersey Stas. Rpt. 1914, pp. 99–139, pls. 6*).—In experiments to determine the value of sour milk as a supplementary feed for growing chicks there did not appear to be any appreciable difference between the palatability of the naturally soured skim milk and a commercial product, Bulgalactine milk. The sour skim milk formed a source of easily digested protein. The chicks receiving sour skim milk consumed a larger amount of mash and on the average more grain, with a corresponding increased rate of growth. The sour skim milk seemed to increase the appetite, causing a greater consumption and a more economical use of the food. Sour skim milk fed chicks made a larger and more uniform gain than those not receiving it, and appeared brighter and healthier at the close of the experiment than did the others. There was also lower mortality in all milk-fed pens than in those not receiving milk.

In a comparison of the effect of a 25 per cent and a 10 per cent meat scrap ration for laying pullets it was found that the increased percentage of meat scrap resulted in an increased egg production which more than offset the increased cost of the ration. The increased percentage of meat scrap showed no detrimental effects upon the vitality of the fowls, but appeared to give them increased vigor. The forced production of the pullet year was not, however, followed by a continued high production during the second year. The birds receiving a lower percentage of meat scrap during the first year kept up a uniform production throughout the second year, not noticeably dropping as in the case of the birds receiving the higher percentage of meat scrap, which seemed to have been somewhat broken down by the heavy production during the previous year. However, it is thought that the forcing of birds during their pullet year for high egg production is justified. During the second year these birds might be kept for breeders, in which case they would receive a lower percentage of meat scrap and no attempt made to force egg production.

Five pens of White Leghorn pullets were fed alike except as to the protein feeds allowed. Pen 1 received meat scrap, or animal protein, and pens 2, 3, 4, and 5, 33 per cent of soy-bean meal, gluten meal, linseed-oil meal, and cotton-seed meal, respectively, in a dry mash. All pens received the ordinary grain mixture. Data are given for the first year's egg production and food consumption, but further work is to be done before definite conclusions are reached. It has been observed that during the first year the mortality is high in the pens receiving the oil meal and the cotton-seed meal. A number of the birds have apparently broken down under the strain of the highly concentrated rations.

Five pens of 50 White Leghorn pullets each were fed alike except as to succulent feeds. Pen 1 received a commercial product, Succulenta tablets; pen 2, dried-beet pulp; pen 3, mangel beets; pen 4, sprouted oats; and pen 5, no succulents of any kind. The total egg production for the year was 4,432, 4,670, 5,347, 5,517, and 4,239 for the respective lots. Further experiments are to be conducted before definite conclusions are reached.

A description is given of a proposed standard multiple unit duck house covering New Jersey conditions, and of a double-pen breeding house to be used for breeding flocks on general farms.

From the results of crossbreeding work with reciprocal crosses of Black Langshans and White Leghorns, it is concluded that the Black Langshan is essentially a white bird with white plumage, white shanks, white beak, and a bay eye. Superimposed upon this is a black pigment. This superimposed black pigment is sex limiting in this mode of inheritance only when the male bird possesses this black pigmentation; in which case, so far as this inheritance in the first generation is concerned, it behaves similar to a dominant character. White Leghorns carry, without a doubt, a factor for barring. Results tend to point to the fact that the factor which inhibits the appearance of the barring (if such a factor is used to explain the nonappearance of the barring) varies in intensity in different individuals, and may vary in the same individual at different times. The cause for this at present is undetermined. Further work along this line is contemplated before definite conclusions are reached.

Preliminary observations indicate the need of shade on the range for growing chicks, results with corn proving more satisfactory on the whole than peach trees or buckwheat for the purpose.

Severe winter weather resulted in a great many frozen combs and wattles and in a general lowering of vitality in all breeding flocks with both males and females. Eggs saved for hatching during that period were found, upon incubating, to be very low in fertility and what fertile eggs were secured were found to contain germs which were weak.

From experiments in progress to determine the relation which exists between the vigor, age, and health of the breeding flock and the hatchability of eggs which are produced, it has been concluded that for hatching eggs should be saved only from hens which have reached maturity, or from hens which have been through at least one complete molt, and from mature birds that have not been excessively forced for heavy egg production during the previous winter and are vigorous and healthy in every respect.

Experiments indicate that there is no advantage in late fall hatched pullets. Birds hatched late in the season did not have time to mature before winter set in and consequently were not fitted for egg production until along in the spring. From tests with various kinds of brooder stoves it is concluded that the most efficient forms are those which have a capacity of from 250 to 300 chicks.

A brief note on summer sickness of fowls, with symptoms of ptomaine poisoning, is given, the trouble being ascribed to eating carrion flesh. There is also a detailed description of a scheme which has been worked out for the cooperative selling of eggs.

Experiments in fattening fowls for market, H. W. Jackson and R. V. Mitchell (*Pennsylvania Sta. Rpt. 1912, pp. 190–208, pls. 2*).—Methods of fattening poultry for market are described, and experimental work reported.

There appeared to be little difference in gains in crate fattening as compared with pen fattening with the American class of fowls. The kind of birds best suited for this kind of feeding are considered to be those of the American class, such as the Barred Plymouth Rocks, Wyandottes, and Rhode Island Reds, and the season of the year best suited for this kind of work from August 15 to November 15.

Experiments in continuation of work previously noted (E. S. R., 28, p. 172) were conducted to determine what feeds are most profitably fed and the best method of feeding. Six groups of two pens each of five 2 to 3 lb. White Leghorn cockerels each were fed for two weeks the following rations: Group 1, white bolted corn meal, low-grade flour, oatmeal, pea meal, buckwheat middlings, and wheat middlings, 24 : 6 : 1 : 1 : 1 : 1; group 2, the same ration as group 1 in the proportion of 12 : 4 : 6 : 6 : 4 : 2; group 3, the same as group 2 in the proportion of 1 : 1 : 10 : 10 : 8 : 4; group 4, white bolted corn meal, oatmeal, low-grade flour, pea meal, buckwheat middlings, wheat middlings, and tallow, 23.5 : 5.5 : 1 : 1 : 1 : 1 : 1; group 5, white bolted corn meal, oatmeal, low-grade flour, pea meal, buckwheat middlings, wheat middlings, and sugar (brown), 22.5 : 5.25 : 1 : 1 : 1 : 1 : 2.25, respectively. Group 6 was a check lot. The cockerels were not profitably fattened on any ration, although the quality of flesh was somewhat improved. The best gains were made on the widest rations, the gains decreasing uniformly with the nutritive ratio of the ration fed.

In a second experiment three groups were fed three weeks on corn meal, low-grade flour, wheat middlings, buckwheat middlings, and buttermilk in the following proportions: Group 1, 65 : 15 : 15 : 5 : 300; group 2, 60 : 10 : 15 : 15 : 200; group 3, 55 : 10 : 15 : 20 : 150. The results of the test indicate that from 1.5 to 1.75 lbs. of buttermilk per pound of ground grain, which makes the ration thin enough to pour, gives better results than a ration either too thick or too thin. It is thought that approximate results might be secured with soured skim milk where buttermilk is not obtainable.

In connection with this experiment it was found that pens receiving no grit or green feed made better gains than the lots with these adjuncts to the ration. Comparing fowls fed in crates with fowls fattened in pens it was evident that Leghorns weighing over 2 lbs. will do decidedly better in pens. Comparing pen-fattened fowls with those on range, the experiment indicates that some con-

finement is an advantage. Pens in which meat scrap was used in addition to the regular grain ration made better gains than pens without meat, but it was found that it can not be substituted for milk to any extent. Taking the total weekly gains of all pens, the best gains (26.7 lbs.) were in the first week and were much smaller (14.78 lbs.) in the second, with a still further reduction (12.36 lbs.) in the third week.

In a third experiment in which rations similar to those in experiment 1 were fed for three weeks it was again found that the best gains were secured with wider rations. The ration containing tallow was most satisfactory in respect to the total gain secured. Gains again dropped as the proportion of protein increased, notwithstanding the facts that rations with milk gave better results than those without, and the use of milk in the mixture necessarily makes a narrow ration with any combination of grain feeds. A comparison of results secured in feeding for three weeks with feeding for two weeks shows that in this experiment practically all the gains were secured during the first two weeks. A comparison of crate feeding and pen feeding gave results favorable to crate feeding.

Experiments to determine the probable profit in fattening farm-raised fowls, previously reported (E. S. R., 28, p. 172), were continued. It was found that whole grain rations produced slight gains at a heavy expense. The addition of meat scrap to grain increased the gains somewhat, but the addition of wheat proved to be a disadvantage. Corn meal with meat scrap, while better than whole grains, was too expensive even when mixed with milk. The addition of low-grade flour produced a material increase in gains. Other conditions being equal, better results were secured when fowls were fattened in a warm room (corresponding to the ordinary temperature in September and October) than in a cold room. It is suggested that this does not indicate the advisability of heating rooms in which to fatten fowls in cold weather, but to indicate the probable desirability of fattening fowls at a time of the year when suitable conditions can be had without expense.

There does not seem to be any advantage in the use of grit and green feed in short feeding tests, but both are probably needed in fattening tests extending over two weeks.

From records kept it appears that the total killing loss in preparing fowls for market was 14.2 per cent in one test and 10.9 per cent in another.

Crude fiber in the ration of laying hens, W. A. Cochel and H. W. Jackson (*Pennsylvania Sta. Rpt. 1912, pp. 220–227*).—This is an amplification of work previously noted (E. S. R., 28, p. 773), with additional notes on the effect of the feeds and methods of handling on the stage of molt among the birds. There appears to be no consistent relationship between the rations fed and the weight of the eggs.

A comparison of simple rations with variety in feeding laying hens, W. A. Cochel and H. W. Jackson (*Pennsylvania Sta. Rpt. 1912, pp. 241–247 pl. 1*).—This is an amplification of work previously noted (E. S. R., 28, p. 773), together with additional notes on feed costs of different rations.

Improving the Kansas egg, W. A. Lippincott (*Kansas Sta. Circ. 51 (1915), pp. 10, figs. 6*).—General directions are given for improving the quality of market eggs.

Experiments in incubation, H. W. Jackson (*Pennsylvania Sta. Rpt. 1912, pp. 209–219, pls. 3*).—This is an elaboration on work previously noted (E. S. R., 28, p. 773). In a study of the best date to discontinue turning eggs in the incubator, it was found that better results were secured by turning eggs until they began to pip. Such turning did not appear to interfere with chicks being in proper position for pipping.

Silver fox farming in eastern North America, N. Dearborn (*U. S. Dept. Agr. Bul. 301 (1915), pp. 35 figs. 22*).—It is said that the silver fox is a color phase of the common red fox. The beauty and rarity of its pelt have made it the most valuable of fur animals. It was first successfully domesticated in 1894 in the Canadian Province of Prince Edward Island. In 1910 pelts from ranch-bred foxes brought higher prices than those from wild foxes, the average value being over $1,300 each. Since that time the demand for breeding stock has been so great that very few domesticated foxes have been slaughtered. Stock companies have been organized to engage in the new industry, with the result that a careful study of foxes in domestication has been made which will contribute materially to the permanence of fox farming.

"A fox ranch should be situated where it will have good drainage and be partially shaded by a young growth of deciduous trees. Each pair of foxes should have a runway of about 2,500 sq. ft. They thrive on a varied diet, including meat, fish, bread, mush, milk, and table scraps. The reproductive period is about 10 years. The young are born in April or May, the average litter containing four cubs; but as only about half of the captive females produce young in any given year, the annual increase has not averaged above 100 per cent.

"Foxes bear captivity well. No widespread disease has appeared among them. Wounds heal readily, and cases of sickness are usually attributable to a lack of proper care. By selective breeding the originators of fox culture produced a superior strain of animals in the course of a few years. This fact is an assurance that even greater improvements can be achieved by selecting, from different geographic races, foxes of the largest size and crossing them with animals having the finest fur."

Report of the biologist (*New Jersey Stas. Rpt. 1914, pp. 253–293, pls. 3*).—Data on the climatic conditions as related to oyster propagation, distribution of oyster fry, spawning, and spatting at the Barnegat and Tuckerton stations during the season of 1914 are given.

DAIRY FARMING—DAIRYING.

Report of the dairy husbandman, A. S. Cook (*New Jersey Stas. Rpt. 1914, pp. 141–169*).—In an experiment to determine the feeding value of cured alfalfa hay as compared with green alfalfa fed as a soiling crop for cows producing milk, and to ascertain the physical effect of green alfalfa fed as a soiling crop with silage as compared with alfalfa hay, two lots of cows were fed by the reversal method during two periods of 40 days each. Both lots received in addition silage, beet pulp, corn meal, gluten, distillers' grains, cotton-seed meal, and bran. The total average weight of the cows on the alfalfa hay ration was practically the same as of those on the soiling crop ration, and the production of both lots remained remarkably constant during the entire experiment. The average daily milk production was 22.6 lbs. per head when alfalfa was fed as compared with 23.1 lbs. on the soiling crop ration. On the alfalfa hay ration 358.4 lbs. of milk fat from milk testing 3.27 per cent was produced, and on the soiling crop ration 364.9 lbs. from 3.29 per cent milk. The cost of feed was $153.90 and the profit over feed cost $100.91 on the alfalfa hay ration as compared with a feed cost of $132.07 and a profit over feed cost of $125.99 on the soiling crop ration. For every pound of alfalfa hay that was fed 1.9 lbs. of milk was produced, while it required 2.68 lbs. of green alfalfa fed in the form of a soiling crop to produce 1.9 lbs. of milk.

Two lots of three calves and three yearling heifers each were fed by the reversal method a soiling crop ration (mainly green alfalfa) and a corn silage ration. Both lots in addition received skim milk, alfalfa hay, corn meal, bran,

oats, and peas. Each ration contained practically the same amount of protein and carbohydrates.

The average daily gain in weight per calf on the soiling crop ration was 1.32 lbs. per day and on the silage ration 1.33 lbs. It required 3.2 lbs. of nutrients for 1 lb. of gain in the soiling crop ration and 3.4 lbs. in the silage ration.

The cost of feed for the station herd was $113.95 per cow last year and $95.24 this year. It is estimated that only 47 per cent of the value of the milk has been spent for feed. The cost of labor, bedding, stabling, etc., per cow per year is estimated at $35.19. The total profit realized per cow per year was $52.19.

Data on the cost of feed and other items for Holstein, Jersey, Guernsey, and Ayrshire calves are given, also records and results of cow testing asssociation work. In a study of these data as regards the relation of the amount of feed fed and the cost of feed to the milk produced it was found that when silage is used in the roughage ration the greatest profit over feed cost in proportion to the amount of milk produced was received when practically the same amount of dry matter was fed in the roughage in the grain, and where 1 lb. of dry matter was fed in the total feed for approximately 1.2 lbs. of milk produced. When the pounds of milk produced for each pound of dry matter fed in the roughage exceeded 3 lbs. and the pounds of milk produced for each pound of dry matter fed in the grain was below 2 lbs. the profit over feed cost was considerably less in proportion to the milk produced. When the pounds of milk exceeded 4 for each pound of dry matter in the grain and were below 2.5 for each pound of dry matter fed in the roughage there was also a decrease in the profit in proportion to the amount of milk produced.

Data are also given on the average production found per cow for 12 months for each breed tested for advanced registry. The average cost of feed for a 7-day record was $4.11, estimated to be slightly above 50 per cent of the value of the product; the average cost of feed for the 30-day test was $15.92, slightly less than 50 per cent of the value of the product. These figures indicate that cows on advanced registry test are being much more economically fed than is generally supposed.

The average amount of feed consumed per cow for one year by the different breeds is computed. The cost of this feed per cow for one year was as follows: Guernsey, $103.14; Jersey, $77.77; Ayrshire, $184.33; Dutch Belted, $105.40; and Brown Swiss, $131.13.

Comparison of certain grain mixtures, H. E. Van Norman and H. P. Davis (*Pennsylvania Sta. Rpt. 1912, pp. 266, 267*).—In an experiment to determine whether there was any appreciable difference in milk yield due to the character of the feeds, when so mixed as to have the same protein to energy ratio but derived from different sources, six lots of three cows each were fed during three periods of four weeks each by the reversal method three different grain mixtures having the same ratio of protein to energy. The greatest difference in milk yield for the periods covered was 0.25 lb. of milk per cow per day, in the next 0.11 lb., and in the third 0.05 lb. per cow per day. In other words, for all practical purposes one mixture was as efficient as another in this experiment, so far as milk yield was concerned, but there was a marked difference in cost of energy per 100 lbs. in the several mixtures.

The least expensive mixture was corn and cob meal, cotton-seed meal, distillers' dried grains, and gluten feed 4.25 : 1 : 3 : 1, having a ratio of protein to energy of 1 : 5 and costing per 100 lbs. of energy $1.79.

The food requirements of milch cows in an open shed as compared with regular stabling, H. E. Van Norman and H. P. Davis (*Pennsylvania Sta. Rpt.*

1912, pp. 259–266).—Records were kept of the condition and production of two lots of six cows each, one lot housed under typical Pennsylvania barn conditions, the other in an open shed from November 30, 1911, to March 14, 1912. The average difference between the indoor and otudoor temperatures was 12.7 degrees at the time of the morning milking and 7.69 degrees at the time of the evening milking.

The time required to care for the group outside and the group inside was practically the same. The amount of bedding necessary to keep the animals in a cleanly condition was estimated to be more for the outside group. The animals all remained in good health throughout the period. The appetite of the outside group was always keener, and they were more alert than the inside group and always more active when turned into the yard for water. The hair was coarse, rough, and long and the hides were stiffer on the outside group.

The water drunk by each group was measured for 15 days, the average consumed by the outside group per cow per day being 64.3 lbs. and for the inside group 61.4 lbs., but the period was deemed too short to be conclusive. The two groups were practically of the same weight at the commencement of the test, and this weight was maintained practically constant until the last three weeks when the outside group started to lose weight. The average milk yield when the temperature was above the average temperature for the week showed almost no variation from the average yield when the temperature was below the average temperature for the week in either group. The variation did not amount to 1 lb. of milk for a lot of six cows in the instance showing the greatest difference.

The average daily milk production for the period was 16.8 lbs. per cow for the outside group and 17.13 lbs. for the inside group; the average daily fat production, 0.978 and 0.917 lb. per cow; the average total solids produced daily, 2.66 and 2.59 lbs. per cow; the total energy produced in milk per cow per day, 7.47 and 7.16 therms; and the daily excess of energy consumed over production, 5.8 and 5.49 therms, respectively.

Food requirements of milch cows in open shed as compared with regular stabling, H. E. VAN NORMAN (*Pennsylvania Sta. Rpt. 1913, pp. 161–163*).—Two lots of representative grade Guernsey cows were fed the same grain mixture and each individual cow fed grain in proportion to her average daily milk yield of the preceding week, with all the silage and hay that she would consume without gaining materially in weight, lot 1 being fed outside all winter and lot 2 inside.

The results so far secured suggest that there is less difference in the yield of milk from cows stabled in the open shed as compared with those in closed barns than is popularly supposed. The feed consumption was practically no greater in the open shed. There was more net energy required for maintenance outside than inside. There was more milk produced inside than outside, but there was more net energy produced in the form of milk outside than inside, due to the difference in the composition of the milk. These differences are thought to be less than the differences which might be due to the variation in the individuality of the animals.

No relation between milk yield and the temperature conditions was noted, although it is thought this would possibly not hold true for a heavy-producing cow.

Summary production of the station herd for twenty-one years, H. E. VAN NORMAN and H. P. DAVIS (*Pennsylvania Sta. Rpt. 1912, pp. 267, 268*).—A summary of the production of the station dairy herd for the past 21 years is given, continuing previous work (E. S. R., 21, p. 270).

Rules relative to testing dairy cows (*Massachusetts Sta. Circ. 57* (*1915*), *pp. 4*).—A revision of Circular 28, previously noted (E. S. R., 24, p. 775).

The Sharples milking machine, H. E. VAN NORMAN (*Pennsylvania Sta. Rpt. 1913, pp. 163, 164*).—In a study of the use of a milking machine it appears that one man using two machines secures the greatest efficiency with a herd of 20 animals, and that as the number falls below this the actual time of the man per cow is increased. One man and two machines apparently can do the work of two hand milkers, and where the number of men required for milking determines the amount of labor on the farm, it is thought the use of the milking machine will be practicable if other circumstances justify the investment.

Germ content of stable air and its effect upon the germ content of milk, G. L. A. RUEHLE and W. L. KULP (*New York State Sta. Bul. 409 (1915), pp. 419–474, figs. 4*).—This bulletin is composed of two parts.

I. *Methods of bacterial analysis of air* (pp. 422–446).—This material has been previously reported from another source (E. S. R., 33, p. 610).

II. *Stable air as a source of bacteria in milk* (pp. 446–474).—In this investigation attention was limited to a study of the contamination due to the general condition of the stable air, no attention being given to localized air contaminations that occur in milking due to dirt falling through the air from the cow's body. An attempt was made to control all conditions which might influence the results and to measure the factor of air contamination as directly as possible. An apparatus is described which was so constructed as to make it possible to imitate the milking process very closely and yet allowed the use of a sterile fluid in the place of milk as drawn from the udder, which, it has been found, contains variable numbers of bacteria.

It was found that the number of bacteria present in the air of the station stable during such barn operations as milking, feeding hay, grain, and the like usually varies between 50 and 200 per liter of air. Occasionally much lower results were secured and also a few much higher, the highest being 825 per liter. When sterile water was "milked" in the station stable from the apparatus designed for the purpose, the germ content of the liquid was found to average 12 per cubic centimeter with a maximum of 73 and a usual range of from 5 to 15 per cubic centimeter.

A large number of tests were made in the stable loft. Here it was easily possible by sweeping up débris from the floor to secure dusty conditions which were as bad as the worst possible conditions obtainable in commercial dairies. When a heavy dust was raised at the beginning of each test the germ content of the air was usually between 1,000 and 2,000 per liter, with an average of 2,068, a minimum of 329, and a maximum of 5,200 per liter. When the dust was maintained continuously throughout the test the numbers obtained in the completely satisfactory determinations averaged 9,575 bacteria per liter of air, with a minimum of 960, a maximum of 28,200, and a usual range of from 2,500 to 10,000 per liter.

Sterile water milked under these extremely dusty conditions gave an average germ content of 47.6 per cubic centimeter when the dust was raised but once, the highest number being 133, and the usual range between 30 and 100 per cubic centimeter. When the heavy dust was maintained continuously the average germ content of the water milked was 604 per cubic centimeter, with a minimum of 69, a maximum of 1,430, and a usual range of from 300 to 1,000 per cubic centimeter.

In three commercial stables 58 analyses gave only seven results in which the germ content of the air was greater than the highest count (825 per liter) obtained in the station stable, and of these seven only four were decidedly higher than this figure. Milking under the worst of these conditions would, as shown by the work done where an artificial dust was raised, have added from 100

to 1,000 or more bacteria per cubic centimeter to the milk. On the other hand, under the conditions usually found in these stables the number of bacteria added to milk drawn would have been so few as to be undetectable by known methods of analyses.

It is suggested that other possible sources of contamination, such as the interior of the udder, the cow's body, the milkers' hands and clothes, and the condition of the utensils be kept in mind in interpreting the importance of the air as a source of milk contamination. Accurate data showing the relative values of each of these sources of contamination are not yet at hand.

Data were secured which show the effect of exposing a pail of milk to the stable air. The data were secured partly by experiment and partly by calculation from the experimental data. Under the conditions obtaining in the station stable it was found that an average of 55 colonies developed from the bacteria which fell on a square centimeter area when dry chopped hay was fed, 71 per square centimeter when dry grain was being fed, and 114 per square centimeter when milking was in progress. When the effect of leaving 5 liters (about 5 qt.) of milk standing in an open 12-in. pail in the open stable for one hour was calculated from these data it was found that the numbers of bacteria which would be added would be 96, 124, and 199 per cubic centimeter under the above conditions. It is deemed probable that no greater contaminations than those just noted occur normally in commercial dairies.

A few analyses indicate, however, that conditions are bad enough at times to produce measurable contaminations in the milk even if this is exposed for a short time only.

Methods of making some of the soft cheeses, W. W. Fisk (*New York Cornell Sta. Circ. 30 (1915), pp. 41–62, figs. 7*).—Methods of making pot, baker's, and cottage, Neufchâtel, cream, and club varieties of soft cheese are described on the basis of tests carried on for several years at the station. Field data, analyses, and a bibliography of 28 references are included.

VETERINARY MEDICINE.

Report of the sixteenth annual meeting of the United States Live Stock Sanitary Association (*Rpt. U. S. Live Stock Sanit. Assoc., 16 (1912), pp. 182, figs. 8*).—The papers presented before the sixteenth annual meeting are as follows: Tick Eradication, a Fundamental Principle Necessary to Consider in the Agricultural Development of the South, by E. M. Nighbert (pp. 19–35); Immunization Against Hemorrhagic Septicemia, by J. R. Mohler and A. Eichhorn (pp. 35–40) (E. S. R., 28, p. 281); Hemorrhagic Septicemia, by S. H. Ward (pp. 40–44); Johne's Disease, or Pseudotuberculosis, by J. G. Wills (pp. 44–50); The Value of Physical Examination and Clinical Diagnosis in the Control of Tuberculosis in Cattle, by V. A. Moore (pp. 51–55); State Control of Contagious Diseases in Live Stock, by J. I. Gibson (pp. 55–58); Advance Registration for Pure-Bred Cattle Free from Tuberculosis, by O. E. Dyson (pp. 58–66); Inspection of City Milk from Producer to Consumer, by G. E. Leech (pp. 66–72); The Sanitary Barn and Clean Milk Production, by C. Way (pp. 72–79); The Control of Hog Cholera with Immune Serum, by P. Fischer (pp. 79–83); Fixed Hog Cholera Virus, by J. Reichel (pp. 83–101); Live Stock Sanitary Control Work in Canada, by F. Torrance (pp. 101–105); Contagious Abortion Bacillus Vaccine, by J. Reichel (pp. 105–111); Contagious Abortion, by W. L. Williams (pp. 111–126); Preventive Measures Against Equine Influenza Based on Its Bacteriology, by N. S. Ferry (pp. 127–146); The Pathology of Parturient Paresis (Milk Fever) and the Calcium Salts as a Factor in the Onset of Labor, by J. H.

Kastle and D. J. Healy (pp. 146–154); Strangles of Horses and Its Control, by B. F. Kaupp (pp. 154–155); and Tests for Glanders Based on Field Work in the State of Wyoming, by B. F. Davis (pp. 155–160).

Report of the seventeenth annual meeting of the United States Live Stock Sanitary Association (*Rpt. U. S. Live Stock Sanit. Assoc., 17 (1913), pp. 255, figs. 7*).—The papers presented before the seventeenth annual meeting are as follows: The United States Government Meat Inspection, by V. A. Moore (pp. 19–24); Measles in Live Stock and Its Relation to Rural Sanitary Conditions, by B. H. Ransom (pp. 24–27); The Diagnosis of Glanders, by J. R. Mohler and A. Eichhorn (pp. 28–33) (E. S. R., 31, p. 83); The Control of Glanders in New York State, by J. F. DeVine (pp. 34–37); The Control of Hog Cholera—A Review of Four Months' Work by the Bureau of Animal Industry, by M. Dorset (pp. 38–46); How May a State Most Effectively Combat Hog Cholera? by J. W. Connaway (pp. 46–48); Necessary Equipment of State Laboratories for the Production of Hog-Cholera Serum, by P. Fischer (pp. 48, 49): Control of Hog Cholera in Germany, by K. Schern (pp. 50–67); Investigations with Swamp Fever, by L. Van Es (pp. 67–71), a bulletin on which has been noted (E. S. R., 26, p. 287); The Purity of the Farm Water Supply and Practical Methods of Insuring Clean Drinking Water, by H. A. Whittaker (pp. 72–78); Delayed Reactions Following Injection of Tuberculin, by J. G. Wills and C. Linch (pp. 78–96), abstracted on page 187; Some Effects of Poor Ventilation, by C. C. Lipp (pp. 97–101); Elimination of Sources of Contamination in Milk, by W. D. Frost (pp. 101–107); The Present Status of the Control of Bovine Tuberculosis by Vaccination, by S. H. Gilliland (pp. 107–112); The Possibilities and Limitations of the Intradermal Test for Bovine Tuberculosis, by C. M. Haring (pp. 114–123); Bovine Tuberculosis in Illinois—Modern Method of Handling in Pure-Bred Herds, by O. E. Dyson (pp. 123–132); The Present and Future Attitude of the Railroads Toward Live Stock Sanitary Control Work, by F. S. Brooks (pp. 132–137); Proper Basis for Interstate Recognition of Health Certificates, by S. H. Ward (pp. 137, 138); The Control of Hog Cholera by Slaughter Methods, by G. Hilton (pp. 138–147) (E. S. R., 31, p. 886); Necessary Regulations for Inspection and Disinfection of Horses and Mules for Interstate Shipment, by C. E. Cotton (pp. 147–150); Official Inspection of Interstate Cattle, by C. J. Marshall (pp. 151–162); The Most Successful Methods of Tick Eradication, by J. A. Kiernan (pp. 163–184); Observations on Dourine in the Northwest, by A. W. Miller (pp. 184–187); Anthrax Immunization and Control, by E. R. Forbes (pp. 187, 188); and Investigations of the Etiology of Infectious Abortion of Mares and Jennets, by E. S. Good (pp. 189–191) (E. S. R., 29, p. 779).

Water hemlock (Cicuta), C. A. Jacobson (*Nevada Sta. Bul. 81 (1915), pp. 7–46, figs. 10*).—This bulletin deals particularly with chemical and toxicological work with Cicuta, an account of which plant by Marsh, Clawson, and Marsh, dealing largely with the botanical and pathological sides, has been previously noted (E. S. R., 30, p. 880). Botanical data and accounts of typical cases of poisoning are included.

The summary as drawn by the author is as follows:

"Water hemlock is an umbelliferous, poisonous plant, growing along the banks of streams and in marshy ground. It is recognized under at least three distinct species in this country, all three containing the same poisonous principle, cicutoxin, which is located primarily in the rhizome or rootstalk of the plant.

"Cicutoxin is an unstable resinlike substance of the formula $C_{19}H_{26}O_3$, and is a complex derivative of pyrone. It decomposes and polymerizes readily, especially at temperatures above 50° C. It is extracted from the tubers by means of ether

and enters violently into combination with free bromin. It forms combinations with lead, barium, hydrochloric acid, ammonia, and yields the double acetyl derivative. A tentative structural formula for the compound has been proposed. A reliable chemical test for its presence has been found. Cicutoxin is a spasmotoxin, producing symptoms that may be separated into a prodromal, a paroxysmal, and a paralytic stage. Death generally results in from 30 minutes to 12 hours. The lethal dose of cicutoxin for the average rabbit is 175 mg. and '50 mg. per kilo body weight' for cats when administered per mouth. Cicutoxin attacks a nerve center in the calamus scriptorius and kills by asphyxiation and exhaustion. It is not a constitutional poison and the lethal dose can not properly be given in terms of milligrams per kilo body weight. No antidote is known, and the most reliable treatment at present consists in producing vomiting and allaying the convulsions by means of a narcotic."

Some observations on the theory and practice of dipping, W. F. Cooper and H. E. Laws (*Parasitology, 8 (1915), No. 2, pp. 190–217, pl. 1, figs. 2*).—This is a critical review of work done in the past, together with deductions drawn from the available data. The subject is taken up under the headings of the process of dipping, the effect of dipping on the tick, the effect of an emulsion in a dipping fluid, the action of the emulsion, does the tick take up arsenic from the blood or from the skin of the dipped host, cumulative action of arsenic in dipping, the quantity of arsenic applied in dipping, the effect on pathogenic organisms of arsenic in the blood of dipped animals, and dipping in relation to trypanosomiasis. Tabular data and notes are presented in several appendixes. A list of 20 references is included.

Suppurative lesions in horses and a calf of California due to the diphtheroid bacillus of Preisz-Nocard, I. C. Hall and C. W. Fisher (*Jour. Amer. Vet. Med. Assoc., 48 (1915), No. 1, pp. 18–30, figs. 2*).—The authors report having observed, during the fall months only, a peculiar abscess formation in eleven horses and one calf, simulating in at least one case the ulcerative lymphangitis of European writers. "These abscesses are usually, though not invariably, located in the prepectoral region and their depth in the tissues supports the idea of a true lymphatic infection; if unopened, however, they ultimately transform into ulcers. Ulcerative lymphangitis is well known abroad, but till now has remained unrecognized in the United States. The disease we have found usually yields to simple surgical treatment, but we have observed one refractory case.

"Pure cultures of the specific cause were recovered from each of these cases and their identity was proved with similar organisms recovered by us from sheep afflicted with caseous lymphadenitis, i. e., the bacillus of Preisz-Nocard.

"In certain cases the infections we have studied bear some clinical resemblance to farcy, epizootic lymphangitis, and sporotrichosis, but may be readily differentiated from these by bacteriological analysis. Further, orchitis in male guinea pigs resulting from the inoculation of pus containing either *B. mallei* or the bacillus of Preisz-Nocard needs offer no confusion in diagnosis if the pus is studied microscopically and culturally."

A list of 32 references to literature on the subject is appended.

Dourine and the complement fixation test, E. A. Watson (*Parasitology, 8 (1915), No. 2, pp. 156–183*).—The purpose of this paper is to draw further attention to the value of the complement fixation reaction as a diagnostic test in dourine and to recommend a method of procedure and technique arrived at with an experience of 15,000 tests for dourine made at the Veterinary Research Laboratory, Lethbridge, Alberta.

The outbreak of foot-and-mouth disease at Birkenhead (*Rpt. Proc. Conf. Birkenhead, Bd. Agr. and Fisheries [Gt. Brit.] and Dept. Agr. and Tech. Instr. Ireland, 1914, Feb., pp. 27*).—This is a report of proceedings at a conference on

foot-and-mouth disease, held at Birkenhead on February 26, 1914, between representatives of the Board of Agriculture and Fisheries and of the Department of Agriculture and Technical Instruction for Ireland, in which evidence relating to the introduction and occurrence of the disease in England is presented.

The identity of Trypanosoma rhodesiense with the trypanosome of the same appearance found in game, W. YORKE and B. BLACKLOCK (*Brit. Med. Jour., No. 2788 (1914), pp. 1234–1236*).—"In favor then of game being the reservoir of human trypanosomiasis in south central Africa we have the following facts: Human beings and game are known to be infected with trypanosomes identical as regards morphology, pathogenicity in laboratory animals, and their development in *Glossina morsitans.* The human trypanosome can be successfully inoculated into game. The peculiar sporadic occurrence of the disease in human beings suggests that they were infected from a widely spread reservoir of the infection (the game) rather than from one another.

"In conclusion, we submit that the hypothesis that man enjoys marked natural immunity and is in consequence to a great extent resistant to infection with this parasite affords a satisfactory explanation of the distribution of the disease, of its comparative rarity, and of the fact that Taute's attempt to infect himself failed."

Concerning the identification of trypanosomes occurring in Russia, L. YAKIMOFF (*Compt. Rend. Soc. Biol. [Paris], 78 (1915), No. 10, pp. 303–306*).—The investigations of the author indicate that the dourine trypanosome (*Trypanosoma equiperdum*) of Russian origin and that of Algeria are identical; that the trypanosome of the ass and of the camel in Bokhara are identical; that the trypanosome of dourine in Russia is not identical with that occurring in the camel and ass in Bokhara or with *T. brucci;* and that the trypanosome of the ass in Bokhara is not identical with *T. brucei.*

Delayed reactions following injection of tuberculin, J. G. WILLS and C. LINCH (*Rpt. U. S. Live Stock Sanit. Assoc., 17 (1913), pp. 78–96, figs. 3*).—"Our experience in a great number of these so-called slight reactions has shown the necessity of great care being exercised in relation to condemning cattle not showing a pronounced temperature rise. It is not unusual to find animals that show a slight elevation of temperature exhibit on slaughter pronounced lesions of tuberculosis. Hutyra and Marek state that in cattle that have had previous injections of tuberculin the reaction passes over sooner than normally and in advanced disease it may set in very late. In our observations we have failed to find this to be the rule, but have found many delayed reactions and few early reactions even in cases where temperatures were taken for 48 hours, beginning 2 hours after tuberculin was injected. Our experiences indicate that the previous injection of tuberculin has a tendency to reduce the extent of temperature rise in a tuberculous animal, and this observation would seem to support the theory of once a reactor always a reactor. Under such circumstances a history of the herd is of value to the examiner in determining what action will be taken, especially with individuals which do not show definite reactions. In badly diseased herds it is unquestionably necessary to consider a slight rise in temperature with more suspicion than in cases where few reactors are found."

History of tuberculosis in the college herd, H. H. HAVNER (*Pennsylvania Sta. Rpt. 1912, pp. 177–190, pl. 1*).—This account is largely a reprint of the bulletin previously noted (E. S. R., 29, p. 885), with some additional data.

The life history of Nematodirus filicollis, a nematode parasite of the sheep's intestine, C. L. BOULENGER (*Parasitology, 8 (1915), No. 2, pp. 133–155, pls. 2, figs. 5*).—A report of studies of this parasite commenced in August, 1913, at Wye, in Kent, and continued at the University of Birmingham.

The investigations showed *N. filicollis*, in spite of but few records of its occurrence, to be extremely abundant at all seasons, and it was found in a large percentage of lambs and yearlings suffering from gastrointestinal troubles, as well as in a number of apparently healthy animals. The nematode usually occurs in the duodenum, but in case of heavy infestation is also found in other parts of the small intestine and has been recorded from the fourth stomach as well. While in a majority of cases it occurs in relatively small numbers, the author has occasionally observed thousands in the duodenum alone, the lambs thus heavily infected always exhibiting symptoms of helminthiasis. To what extent the symptoms are due to the presence of *N. filicollis* could not be determined, as this nematode is always associated with other parasites both in the small intestine and other parts of the alimentary tract. Among the parasites found associated with it in the small intestine were the tapeworm *Moniezia expansa*, and the nematodes *Bunostomum trigonocephalum*, *Ostertagia circumcincta*, *Cooperia oncophora*, *Trichostrongylus vitrinus*, and *Strongyloides papillosus*.

"The eggs of *N. filicollis* when laid contain an embryo with seven or eight cells; they pass out of the infested host with the feces. Even under favorable conditions development takes place slowly, and the embryos are not ready to hatch until 24 to 28 days have elapsed. In their early stages the embryos are not able to withstand desiccation and are killed if frozen or subjected to high temperatures. . . .

"The sheathed larvæ are often retained for a long time within the eggshells, and both in this position and after hatching can resist complete desiccation for considerable periods (20 months or even longer); when dried they are able to withstand freezing as well as temperatures much above those likely to be met with in the open. The free larvæ will live for a considerable time in water. They possess well-developed migratory instincts and climb vertical surfaces such as grass stems and blades and the glass walls of the vessels in which they are kept. The sheaths are cast off by the larvæ when these are subjected to temperatures approximating to the blood temperature of the host; completion of the second molt occasionally also takes place at laboratory temperatures under certain abnormal conditions.

"No infection experiments were made on sheep, but other evidence shows that these animals must become infected by swallowing the sheathed larvæ either when free or while still inclosed in the eggshells. A number of young stages of the parasite were met with in the intestines of sheep, the smallest of these being only little more advanced in structure than the larvæ just after ecdysis."

A list of 24 references to the subject is appended.

Umbilical necrobacillosis in lambs, W. B. MACK (*Amer. Vet. Rev., 47* (*1915*), *No. 5, pp. 592–597, figs. 3*).—The author reports upon an outbreak of this disease in Nevada in which 70 per cent of a loss of 2,200 lambs was due to this affection, as previously noted (E. S. R., 33, p. 676).

The State, the owner, and the veterinarian in relation to hog cholera serum and virus, M. H. REYNOLDS (*Amer. Vet. Rev., 47* (*1915*), *No. 5, pp. 558–569*).—The author describes a plan for hog cholera control work by and under the supervision of the State and reports practical field tests of it made in Minnesota.

Hog cholera, E. A. CAHILL (*Jour. Amer. Vet. Med. Assoc., 48* (*1915*), *No. 1, pp. 31–38*).—A discussion of this disease, particularly as regards Massachusetts conditions.

Directions for the dissection and study of the cranial nerves and blood vessels of the horse, G. S. HOPKINS ([*Ithaca, N. Y.*]*: Author, 1913, pp. 35,*

pls. 5).—This companion work is arranged on the plan of the guide previously noted (E. S. R., 33, p. 87).

The control of contagious epithelioma in chickens by vaccination, W. B. Mack and E. Records (*Nevada Sta. Bul. 82* (*1915*), *pp. 5–16*).—This is a report upon vaccination experiments made during the course of outbreaks in seven flocks, brief reference to which work has been previously noted (E. S. R., 33, p. 676).

"The use of a virus prepared by triturating the morbid products collected from the skin and mucous surfaces and attenuated at 55° C. for one hour checked the spread of the disease promptly and exercised a favorable influence upon visibly infected birds. Cases thus treated ran a shorter and milder course than those not treated, and the mortality was materially reduced. Two injections were sufficient in most instances, but severe advanced cases benefited by a third and larger dose." In five flocks, containing 3,062 birds, 1,668 of them thoroughly exposed and 1,394 visibly infected, the spread of the disease after vaccination was negligible. Of the 1,394 visibly infected birds treated, 1,094, or 78.55 per cent, recovered.

"On the whole the treatment was satisfactory and successful. In five flocks no unfavorable results followed the subcutaneous administration of the vaccine, but in two flocks serious toxic and septic processes were apparently caused by it. The crude preparation used is not, therefore, without danger, and a more refined product must be devised."

Campaign to eliminate bacillary white diarrhea (*Massachusetts Sta. Circ. 56* (*1915*), *folio*).—The agglutination test for the detection of the causative organism of this disease (*Bacterium pullorum*) having made it possible to eliminate infected fowls from breeding flocks, the station cooperating with the extension service herewith announces its preparedness to begin testing breeding hens. The collection of blood samples will be made by the extension service, and the agglutination tests by the station.

RURAL ENGINEERING.

Excavating machinery used in land drainage, D. L. Yarnell (*U. S. Dept. Agr. Bul. 300* (*1915*), *pp. 37, pls. 9, figs. 2*).—This bulletin discusses the development of excavating machinery and deals with the essential features of construction, cost, operation, cost of operation, and selection for certain conditions of the floating dipper dredge, the floating grab-bucket dredge, the dragline scraper excavator, the dry-land dipper excavator, the dry-land grab-bucket excavator, the templet excavator, the wheel type of excavator, the hydraulic dredge, and machines for cleaning old ditches.

"The floating dipper dredge is more widely used in drainage work than is any other type of excavating machine. For work through wet land no other excavator will equal it in cheapness of construction of ditches having a cross section of from 100 to 1,200 sq. ft. It is by far the most efficient machine to use where many stumps will be encountered. Owing to its limited reach it is not generally applicable to levee construction. . . . The floating dipper dredge should be operated downstream, where practicable.

"In general, the clam-shell or orange-peel dredge is not well adapted to ditch construction, especially if there are stumps to handle. Certain types of soil, such as the muck of southern Louisiana, can, however, be handled to advantage with this machine. It is also suited to levee building when equipped with a long boom.

"The dragline scraper excavator is . . . especially suited to the construction of ditches and levees of large cross section where the ground is sufficiently stable to support the machine. The scraper excavator is also suitable for ditch cleaning.

"The various forms of so-called dry-land machines find quite extensive use in drainage. The dipper and orange-peel dredges of the dry-land type are suitable for use where sufficient water can not be had to float a dredge. The templet and the wheel types of excavators are applicable to open land where the soil is neither too hard nor too wet. The ditches cut by these latter machines are superior in hydraulic efficiency to those of similar section cut by any other type of excavator. The dry-land machines should be operated upstream. The hydraulic dredge is not suited to ordinary drainage ditch construction. It has been used to some extent in cleaning ditches and, with the use of slope boards, has in at least one instance made a satisfactory record in levee construction."

State highway mileage and expenditures to January 1, 1915 (*U. S. Dept. Agr., Office Sec. Circ. 52 (1915), pp. 6*).—This circular, prepared by the Division of Road Economics of the Office of Public Roads and Rural Engineering, reports data showing that in the 20-year period ended January 1, 1915, expenditures aggregating $211,859,163 have been made by 39 States for the construction of 35,477 miles of improved roads.

Other data showing the distribution of expenditures under state control for the year 1914 are also reported.

Highway bonds, L. I. Hewes and J. W. Glover (*U. S. Dept. Agr. Bul. 136 (1915), pp. 136, pls. 9*).—This bulletin presents a compilation of data and an analysis of economic features affecting the construction and maintenance of highways financed by bond issues, and discusses in addition the theory of highway bond calculations.

The following topics are covered: County highways, economic value of the market road, cost of highway construction, cost of highway maintenance, the bond issue, total cost of highways, and expediency of issuing highway bonds. The following appendixes are included: State highway bonds; approximate lists of county and district highway and bridge bonds; table showing cost elements of gravel, macadam, and bituminous macadam roads in Maine, Massachusetts, and New Jersey; and theory of interest applied to highway bond calculations.

Trail construction on the National Forests (*U. S. Dept. Agr., Forest Serv., Trail Construction on National Forests, 1915, pp. 69, pl. 1, figs. 22*).—It is the purpose of this handbook (1) to establish a uniform classification of trails on the National Forests in accordance with their use, (2) to establish standard specifications for each class, (3) to describe approved methods of location, construction, and maintenance, and (4) to furnish reference data useful in preparing estimates and in actual construction work.

Trails following main valleys and streams are classed mainly as A and those following ridges or tributary streams under B or C. The important points to consider in the location of a trail are enumerated as follows: (1) A south exposure has less snow, is drier, often more open, and has an increased fire hazard, (2) ridges afford less expensive trail routes than valleys, but the period of use is correspondingly reduced, (3) steep side hills, near the angle of repose, are liable to landslides or snowslides, (4) bridges and temporary structures should be avoided as far as possible, and (5) the permanence of a trail depends on the material and its drainage. Three standard maximum grades for trail construction are given, namely, 6 per cent, 12 per cent, and 18 per cent. Twelve per cent is considered the limit for safe mountain roads, while 18 per cent is designated as the maximum efficient trail grade. It is stated that long, steep grades should have breaks at frequent intervals where animals may rest and recover, which for grades between 15 and 20 per cent should be spaced about 200 to 300 yds., and

for grades exceeding 20 per cent about 100 to 150 yds. apart. The resting places should be about 30 ft. in length and should not exceed a 5 per cent grade. The best grade between any two points is upon a line having the same percentage from beginning to end, and the avoidance of reversed grades, if possible, is recommended.

Under construction it is stated that the width of clearing should be sufficient for the easy passage of loaded pack animals. A maximum width of trail, on solid foundation, of 48 in. is considered sufficient, while 15 in. is the minimum set for class A trails. The tread should have a slope toward the hill of about 1 in. per foot. In grading, the cut bank should be sloped according to the angle of repose of the material sufficiently to prevent sliding from the upper side. If a switchback is found necessary it should be made so that a horse can walk around the turn. Turns should be made level and with a minimum radius of 4 ft., and the grade of the trail approaching and leaving the turn should not exceed 5 per cent for a distance of a few yards.

Other general information regarding construction is given, including drainage, corduroy construction, and slide and solid rock work.

With reference to bridges, it is stated that the factors affecting the selection of a bridge site are, in order of their importance, shortness of span, favorable banks, minimum range of high water, straight and unobstructed channel above and below, and accessibility. The ideal site is one where the stream is narrow and straight and affords free and unobstructed flow, even in flood stage, and the banks are high and of solid material. Specimen designs for types of bridges, with dimensions of members for different spans, are given. It is stated that for spans less than 20 ft. a simple nontruss stringer bridge will adequately meet the needs, while for spans between 20 and 36 ft. the king truss design will ordinarily be most suitable, and the queen truss for spans between 36 and 60 feet. Cable suspension bridges are considered to be especially applicable to spans of from 75 to 200 ft., while trestle bridges are used only to cross deep canyons or draws with a small stream flow.

"On account of the variability in the strength of green timber, bridges of such material are commonly built with a large factor of safety." Under existing conditions of trail work on the forests, it is stated that stringers less than 12 in. in diameter are not generally used in spans of 8 ft. or over.

Tables are given showing the minimum safe dimensions for bridge members. The bridge plans shown are designed for a total load, live and dead, of 125 lbs. to the square foot, and when good structural timber is used afford a factor of safety of 6. In this connection it is stated that snow loads on forest bridges usually exceed any live loads to which such structures may be subjected.

Other general information is given regarding bridge construction and a final section is included on administration. A section enumerating the tools necessary in trail and bridge work is appended.

Telephone construction and maintenance on the National Forests (*U. S. Dept. Agr., Forest Serv., Telephone Construction and Maintenance on the National Forests, 1915, pp. 83, pls. 2, figs. 43*).—This pamphlet gives detailed instructions, with illustrations, as to the construction and maintenance of telephones in National Forests. A form of contract between a commercial telephone company and the Secretary of Agriculture for telephone service in connection with the National Forests is appended.

A small aero-electric plant, E. H. WILLIAMSON, JR. (*Sci. Amer., 113 (1915), No. 10, pp. 200, 201, figs. 6*).—Directions for constructing a small wind power plant for the generation of electrical current are given, with illustrations.

The generation of hydrocyanic acid gas in fumigation by portable machines, H. D. YOUNG (*California Sta. Circ. 139 (1915), pp. 8, figs. 5*).—This cir-

cular describes two portable machines for the generation of hydrocyanic acid gas for fumigation and reports a study of the accuracy of the machine method as compared with pot generation.

The first machine consists of a cylindrical drum within which there is a tray suspended. Mounted above the drum are two reservoirs for sulphuric acid and cyanid solution, respectively. These solutions are measured in cylinders and are then run within the drum. The gas is very quickly generated and by its own pressure forced through the outlet hose under the tent. The chief difference in principle of pot and machine generation is that in the machine the cyanid is added in solution instead of in the solid form as in the pots and the generation, therefore, takes place much more quickly.

The second machine consists essentially of two tanks, one above the other. In the lower tank is placed the sulphuric acid and water, in the upper one the cyanid solution. By the action of a suitable pump measured quantities of the cyanid solution are forced into the tank containing the acid and water and the gas is generated almost instantly and discharged through the delivery hose with considerable force. The basic principle involved is that small successive quantities of cyanid solution are added to a large amount of acid and water until the acid is nearly exhausted.

The drip from the delivery hose of the second machine was analyzed for over 300 charges without finding a trace of sulphuric acid. The experimental results showed the high and uniform percentage of gas evolved when the latter machine was working with fairly high charges at short intervals. Almost as satisfactory results were obtained with a longer interval. "A rate of 30 charges per hour is probably as slow as it is wise to run the machine and with small charges this is too slow." With 4-oz. charges a smaller, but still efficient, amount of gas developed. "The best production of gas is obtained with a high temperature. It is extremely important to keep the cyanid solution and tank scrupulously clean. Any dirt or small bits of wood may interrupt the pump and so make the charges irregular. Under normal conditions with clean solutions the pump works with great regularity."

The silo in California agriculture, F. W. Woll (*California Sta. Circ. 138 (1915), pp. 23, figs. 7*).—This circular gives general information in regard to silo construction, silage crops, and the feeding of silage, with special reference to California conditions.

The construction of poultry buildings, J. Hadlington (*Dept. Agr. N. S. Wales, Farmers' Bul. 100 (1915), pp. 15, figs. 8*).—This bulletin describes and illustrates the continuous-house principle for poultry buildings, a combined roosting and scratching shed, and the colony system, with specifications.

Standards of ventilation in the light of recent research, C. E. A. Winslow (*Science, n. ser., 42 (1915), No. 1080, pp. 358, 359*).—This is an abstract of a paper presented at the recent meeting of the Society of American Bacteriologists reviewing the investigations of the New York State Commission on Ventilation previously noted (E. S. R., 34, p. 70).

Ventilation in its relation to air-borne diseases, A. C. Abbott (*Science, n. ser., 42 (1915), No. 1080, p. 358*).—This is an abstract of a paper presented at the recent meeting of the Society of American Bacteriologists reviewing various observations which have been made on this subject. The author reaches the conclusion that ventilation has nothing whatever to do with either the transmission of the so-called "air-borne" diseases or the lessening of their transmission. He is of the opinion "that transmission by way of the air, strictly speaking, is of infinitely less importance than transmission by animate and inanimate carriers that have been in intimate contact with the patient."

RURAL ECONOMICS.

Measure of rural migration and other factors of urban increase in the United States, J. M. GILLETTE and G. R. DAVIES (*Quart. Pubs. Amer. Statis. Assoc., n. ser., 14 (1915), No. 111, pp. 642–653*).—The authors have attempted to measure the urban increase as it is influenced by various causes.

Among the conclusions reached were that the decennial birth rate was 24.7 per cent for the urban population as against 30.36 for rural. By subtracting the losses by death, it is estimated that the natural increase for urban districts was 8.8 and for rural districts 16.9. Of the gain in urban districts between 1900 and 1910 of 11,826,000 persons, it is estimated that 4,866,000 was due to immigration from abroad, 2,509,000 to the natural increase in population, 924,000 to the incorporation of new territory with urban territory, and 3,527,000 to migration from rural districts.

Contributions to urban growth, E. CLARK (*Quart. Pubs. Amer. Statis. Assoc., n. ser., 14 (1915), No. 111, pp. 654–671, fig. 1*).—The author, by a study of comparative birth and death rates and migration, concludes that between 1900 and 1910 from 30 to 37.1 per cent of the total increase in urban population was due to alien immigration, 27.3 per cent to natural increase, and 35.6 to 42.7 to migration from the country to the city.

Farm leases in Iowa, O. G. LLOYD (*Iowa Sta. Bul. 159 (1915), pp. 157–206, figs. 8*).—This report is based partially upon a detailed study of 114 selected farms previously noted (E. S. R., 32, p. 390), and partially upon the Census returns for agriculture. Among the conclusions drawn are the following:

"Farms with double the amount of total capital produced double the amount of labor income. The advance in the price of land caused owners to enlarge their farms in order to get the rise in price. Large farms used labor more efficiently than small farms and had less per acre, but in each group of farms of the same size those with the highest labor cost made the highest labor income. . . . Live stock farms with about four times as many animal units per acre as grain farms made about four times the labor income and produced one-half more corn per acre. The group of tenants with five times the capital of the smallest capital group remained on the same farms nearly three times as long and made more than eight times the labor income."

He found that there is a reasonably fair division of the net income on these farms at the present time. Tenants received a net income of about $1,750, or more than three times the net income of a farm hand. Landlords receive a net income of about 8½ per cent, or more than double the time deposit rate of the State. Speculation in land is deemed largely responsible for the difference between the market price and the productive value of land. Land has advanced in price at a more rapid rate than rent, due to an anticipated rise being added to the present price.

It is held that the method of renting could be improved by supplying adequate capital and capable supervision to equip and manage the farm. A number of systems were found, designated as the stock-share system, the share-cash system, and the cash system. The stock-share and cash rented farms have more than one-half larger business than farms under other methods of renting, and have one-fourth larger farms and more labor per acre. Stock-share rented farms had three times the number of live stock kept on bushel rented farms and obtained one-third higher corn yields. Tenants remained on the same farm the longest time when renting under the cash and stock-share plans. The stock-share rented farms were more profitable, and considering the risk and trouble in each method of renting, the stock-share method is deemed more fair than any of the others.

The bulletin also contains a model lease, points out the principal provisions of a satisfactory lease, and gives detailed data for a number of farms, indicating how the capital should be invested, the receipts to be expected, and the expenses to be paid in order that fair profits may be secured and high yields maintained.

Formulas for calculating interest on farm equipment, W. J. SPILLMAN (*U. S. Dept. Agr., Office Sec. Circ. 53 (1915), pp. 4*).—The author believes that interest should be charged on that part of the original cost represented by the estimated length of the original life of the machine yet available. The total interest charge would be one-half the product of the cost of the machine by the interest rate and the number of years of life of the machine plus one. The average interest cost can be obtained by dividing the total interest charge by the number of years in the life of the machine.

Finding facts for farmers, C. J. BRAND (*Agr. Student, 22 (1915), No. 1, pp. 35–37*).—In this article the author has briefly described the principal types of work being carried on in the Office of Markets and Rural Organization of the U. S. Department of Agriculture.

Report of the Agricultural Organization Society, 1915 (*Rpt. Agr. Organ. Soc. [London], 1915, pp. XI+109*).—Contained in this report is the usual information relating to the number of societies and the extent of their activities (E. S. R., 32, p. 792). This number also gives special information concerning their operations under war conditions.

Our foreign trade in farm and forest products (*U. S. Dept. Agr. Bul. 296 (1915), pp. 51, figs. 2*).—This bulletin, prepared under the direction of P. Elliott, continues data previously noted (E. S. R., 28, p. 89), but in place of statistical tables previously used the extent of the imports and exports of the various agricultural items is noted only in the text.

It is pointed out that "the foreign trade of the United States has increased more than tenfold during the last 64 years, the products interchanged with foreign countries being valued at $400,000,000 in 1851 and $4,259,000,000 in 1914. The exports of domestic merchandise were valued at $179,000,000 in 1851, of which $147,000,000, or 82.1 per cent, were agricultural products; the exports of domestic merchandise increased to $2,330,000,000 in 1914, of which the agricultural value was $1,114,000,000, or 47.8 per cent.

"The imports of merchandise in 1851 were $211,000,000, of which $61,000,000, or 27.7 per cent, were agricultural products; this trade increased to a grand total of $1,894,000,000 in 1914, of which the agricultural portion was $924,000,000, or 48.8 per cent. . . .

"The principal domestic farm and forest products exported from the United States during the five-year period, 1910–1914, are cotton, packing-house products, grain and grain products, and forest products, which represent over three-fourths of the total domestic farm and forest products exported. Cotton exceeded all other items in the value of domestic farm products exported, having an average annual value of $550,000,000; packing-house products, next in order, were valued annually at $155,000,000; grain and grain products, over $150,000,000; and forest products, $100,000,000. . . .

"The principal farm and forest products entering into the import trade of the United States during the five-year period, 1910–1914, are packing-house products, coffee, animal fibers, and sugar. The average annual value of each of these four articles exceeded $100,000,000, while their combined annual values amounted to over one-half of the total imports of farm and forest products."

Report on agriculture in the Netherlands for 1914 (*Dept. Landb., Nijv. en Handel [Netherlands], Verslag en Meded. Dir. Landb., No. 3 (1915), pp. LXXXIV+142*).—There are given in this annual report data as to the amount

of land used for different agricultural purposes by Provinces, the area devoted to different crops and average yields, number of live stock, number of agricultural exploitations by sizes, extent of cooperative organizations, number and business transactions of cooperative creameries, transactions of rural credit institutions, and prices and imports and exports of the principal agricultural products.

Germany's imports and requirements of agricultural products from foreign countries, F. Wohltmann (*Kühn Arch., 6 (1915), pt. 1, pp. 239–295*).—In this article the author has given for 1902–1905, 1907–1910, 1911, 1912, and 1913 data as to the imports, exports, and trade surplus and deficits for practically all kinds of agricultural produce and fertilizing materials used in Germany, as well as estimates for the per capita trade surplus or deficits for the principal items.

Prices and wages in India (*Dept. Statis. India, Prices and Wages India, 1915, pp. VI+226*).—This report contains wholesale prices for 1912–13 at the principal markets, average annual prices from 1897 to 1913, import and export prices, and a comparison of the average price in India and the United Kingdom in 1873 and 1889–1913 of the principal agricultural products and live stock.

AGRICULTURAL EDUCATION.

The value and methods of teaching the fundamental subjects in the veterinary curriculum, H. S. Murphey (*Cornell Vet., 5 (1915), No. 3, pp. 117–130*).—In this paper, presented at the meeting of the American Veterinary Medical Association, at Oakland, Cal., in September, 1915, the author discusses some of the things that he thinks should be considered in outlining and teaching a course in veterinary medicine at the present time.

"Based on the assumption that the end in view is the training of men to practice or to do other work in the treatment and control of disease in animals, in other words, the foundation for special surgery, obstetrics, medicine, food inspection, and sanitation," he would include physics, chemistry, zoology, botany, anatomy, physiology, bacteriology, parasitology, pathology, and clinical diagnosis—both physical and so-called laboratory diagnosis. He concludes, among other things, that the fundamental subjects should be taught from a veterinary standpoint, that the objective method of teaching is the best, that special surgery, medicine, etc., can not be properly taught to students who do not know the fundamental facts and principles of the foundation subjects, that college courses need readjusting so that each subject will receive its just share of time and material, that more time and money must be spent in training the student than at present, that use should be made of increased knowledge from all sources, etc.

The importance of anatomy and physiology in animal breeding, R. Disselhorst (*Kühn Arch., 6 (1915), pt. 1, pp. 33–49*).—The author discusses the importance of a knowledge of anatomy and physiology in the study of animal breeding.

Teaching animal husbandry in high schools, W. W. Smith (*Purdue Agr., 10 (1915), No. 1, pp. 12, 43, fig. 1*).—The author briefly outlines the necessary qualifications of the teacher of animal husbandry and the method of teaching subjects best suited for high-school instruction, viz., types and breeds of farm animals and feeds and feeding, in a standard high-school course of 18 weeks.

The rural school system of Minnesota: A study in school efficiency, H. W. Foght (*U. S. Bur. Ed. Bul. 647 (1915), pp. 56, pls. 10, figs. 4*).—This study of the efficiency of rural schools in Minnesota includes a discussion of the progress in industrial education in the state high schools, Holmberg consolidated schools, and associated schools. It is shown that the attendance of students on the agri-

cultural courses increased from 1,331 in 1909–10 to 4,053 in 1913–14 in 138 schools, taught by graduates of the agricultural colleges. The attendance of students in cooking classes has increased from 637 in 1908–9 to 5,799 in 1913–14, and in sewing from 994 to 6,680.

The school system of Ontario with special reference to the rural schools, H. W. FOGHT (*U. S. Bur. Ed. Bul. 659 (1915), pp. 58, pls. 12*).—In this study of the rural schools of Ontario special emphasis is given to such phases as have seemed of greatest interest in view of certain prevailing American conditions. Attention is called to the successful efforts of the provincial department of education to make the most of its small one-teacher schools by the introduction of agriculture in the form of school gardening and home projects; the practical system for school maintenance and inspection; and the preparation of rural teachers in model schools, normal schools, and at the provincial agricultural college. In a discussion of recent progress in agricultural education it is found (1) that real progress did not begin until textbook courses were abolished and the subject ceased to be obligatory and was made attractive and practical as a part of the daily experience of each child; and (2) that the success of elementary agriculture in Ontario rural schools must be sought in teachers properly prepared for their work, the satisfactory division of the school year, government grants to schools, and a good system of organization.

Elementary agriculture and horticulture in rural and village schools of Ontario, Canada, S. B. MCCREADY (*Nature-Study Rev., 11 (1915), No. 5, pp. 217–229*).—The author reviews the outstanding features in the development of a scheme of teaching agriculture and horticulture in the elementary schools of Ontario, beginning with the publication of a text on agriculture for the schools in 1845 and the instruction of teachers in agriculture in 1847, discusses the relation between nature study and agriculture and the general method of teaching elementary agriculture, and gives an outline of instructions and a suggested yearly program arranged by months for use by teachers in reporting on instruction given.

Agricultural instruction in Chile. The Agricultural Institute of Santiago, V. V. URBINA (*Hacienda, 10 (1915), No. 11, pp. 340, 341, figs. 5*).—A brief historical review of the establishment of higher agricultural instruction in Chile and a description of the equipment of the Agricultural Institute of Santiago and the objects of its 4-year course are given.

Rural Denmark and its schools, H. W. FOGHT (*New York: The Macmillan Co., 1915, pp. XV+355, pls. 15, figs. 8*).—The subject matter of this book has appeared in somewhat modified form in previous publications (E. S. R., 31, p. 598; 32, pp. 493, 794).

Poultry instruction, MAYNIE R. CURTIS (*Jour. Amer. Assoc. Instr. and Invest. Poultry Husb., 1 (1915), No. 10, pp. 73–76, 77*).—A brief account is given of 11 years' work in poultry instruction in Ireland.

Elementary agriculture, W. L. NIDA (*Chicago: A. Flanagan Co., 1915, pp. VI+294, pl. 1, figs. 140*).—This is a revised edition of an earlier publication (E. S. R., 30, p. 598), in which a chapter on boys' and girls 'clubs, and exercises, problems, and experiments in various subjects treated in the text have been added. It does not include a list of One Thousand Questions on Agriculture Answered contained in the 1913 teachers' edition of this text.

Illustrated lecture on the production of poultry and eggs on the farm, H. M. LAMON (*U. S. Dept. Agr., States Relations Serv. Syllabus 17 (1915), pp. 22*).—This lecture on poultry and egg production, prepared in cooperation with the Bureau of Animal Industry, treats of breeds and breeding, feeding, meat and egg production, houses, marketing, diseases, and storing or preserving

eggs. A list of 51 lantern slides designed to illustrate the lecture and a list of references to literature on poultry keeping are appended.

Agricultural extension, A. AGEE, A. L. CLARK, J. H. VOORHEES, and A. J. FARLEY (*New Jersey Stas. Rpt. 1914, pp. 175–199*).—This includes a report of the division of extension in agriculture and home economics as to organization, financial support, and work, and reports of the extension specialists in poultry husbandry, agronomy, and horticulture.

MISCELLANEOUS.

Annual Report of New Jersey Stations, 1914 (*New Jersey Stas. Rpt. 1914, pp. XXVI+504, pls. 47, figs. 2*).—This contains the organization list of the stations, a financial statement for the State Station for the fiscal year ended October 31, 1914, and for the College Station for the fiscal year ended June 30, 1914, a report by the director, and departmental reports, the experimental features of which are for the most part abstracted elsewhere in this issue. Reports of the fertilizer and lime inspections have been noted in Bulletins 272 (E. S. R., 32, p. 624) and 274 (E. S. R., 33, p. 27), and feeding stuffs in Bulletin 271 (E. S. R., 32, p. 667).

Thirty-third Annual Report of New York State Station, 1914 (*New York State Sta. Rpt. 1914, pt. 1, pp. VIII+997, pls. 59, figs. 41*).—This contains the organization list; a financial statement as to the federal funds for the fiscal year ended June 30, 1914, and as to the state funds for the fiscal year ended September 30, 1914; reprints of Bulletins 373–393, Technical Bulletins 32–39, Circulars 26–32, and popular editions of Bulletins 373 and 380, 374, 375, 378, 379, 381–383, 387–389, 391, and 392, and all of which have been previously noted; a list of the periodicals received by the station; and meteorological observations noted on page 118 of this issue.

Annual Report of Pennsylvania Station, 1912 (*Pennsylvania Sta. Rpt. 1912, pp. 826, pls. 152, figs. 24*).—This contains the organization list, a financial statement for the fiscal year ended June 30, 1912, a report of the director showing by projects the work of the station during the year, and departmental reports, the experimental work in which is abstracted elsewhere in this issue. The report also contains several special articles abstracted elsewhere in this issue, and a reprint of Bulletin 118, previously noted.

Annual Report of Pennsylvania Station, 1913 (*Pennsylvania Sta. Rpt. 1913, pp. 750, pls. 124*).—This contains the organization list, a financial statement for the fiscal year ended June 30, 1913, a report of the director on the work and publications of the station during the year, and departmental reports, the experimental work in which is abstracted elsewhere in this issue. The report also contains several special articles abstracted elsewhere in this issue, and reprints of Bulletins 121 and 124, previously noted.

Annual Report of South Dakota Station, 1915 (*South Dakota Sta. Rpt. 1915, pp. 28*).—This contains a report by the director on the organization, work, and publications of the station, a list of exchanges, a financial statement for the fiscal year ended June 30, 1915, and departmental reports.

List of bulletins available for general distribution (*West Virginia Sta. Circ. 21 (1915), pp. 4*).—The publications of the station and extension department available for general distribution are listed and briefly described.

NOTES.

Alabama College and Station.—Dr. F. A. Wolf, plant pathologist, has accepted a position as head of the department of botany and plant pathology at the North Carolina College and Station, beginning January 1, and succeeding H. R. Fulton, who has accepted an appointment with the Bureau of Plant Industry of this Department.

Arizona Station.—J. F. Nicholson, bacteriologist at the Idaho College and Station from 1909–1914, and subsequently agricultural expert for a western railway system, has been appointed agronomist beginning January 1. W. E. Bryan, assistant in agronomy in the Louisiana Stations and who received the M. S. degree at the University of Wisconsin in 1915, has been appointed assistant plant breeder beginning February 1.

Massachusetts College and Station.—The college is asking the legislature for appropriations of $382,000 for immediate needs, including $230,000 for a library building, $40,000 for a dormitory, $35,000 to complete the power plant, $12,000 to complete the rural engineering shops, $60,000 for miscellaneous improvements, and $5,000 for extra labor due to the enactment of the Saturday half holiday law. It is also requesting an authorization of $200,000 per annum for five years for new buildings, improvements, equipment, and the purchase of land.

A temporary exchange of instruction in landscape gardening has been effected with the University of Illinois, F. A. Waugh lecturing at the latter institution in exchange with R. R. Root.

R. Hay Ferguson, for the past two years extension professor of agricultural economics, died December 1, 1915. Professor Ferguson was born in Belfast, Ireland, September 22, 1870, afterward moving to New Zealand and graduating from Canterbury University. In 1913, he was graduated from the Ontario Agricultural College, specializing in agricultural economics. His special field of work in Massachusetts was the organization of cooperative exchanges and marketing, and he had also suggested a plan for a rural credit system.

Missouri University and Station.—The station has been authorized to establish two additional soil experiment fields. One of these is to be on either the Mississippi or Missouri River bottom lands in the central or eastern part of the State, the other on the river bottom land on one of the smaller rivers in northwest Missouri.

Nebraska University.—The technical course in forestry in the college of agriculture was abolished in the spring of 1915 and farm forestry organized under the department of horticulture. T. W. Nicolet was appointed assistant professor of horticulture to offer courses in farm forestry and landscape gardening, and entered upon his duties October 15, 1915.

Cornell University.—An inventory or survey of the natural resources of the State, with particular reference to the development of a permanent agriculture, is contemplated. It is announced that this work will in no sense duplicate other state agencies, but looks toward the unification and cooperation of all the available forces and agencies within the State to secure joint action in developing and preserving its resources.

The Bureau of Farmers' Institutes held its seventeenth annual normal institute at the university November 10–12. The program included about 50 speakers, particular prominence being given to cooperation and the marketing and distribution of farm products. There were special sessions on poultry husbandry and a women's conference. During the same week was also held the third annual meeting of farm bureau managers.

New York State Station.—Edward J. Lewis, formerly employed in commercial work, has been appointed assistant chemist. He succeeds R. F. Keeler who has been transferred to inspection work, vice F. N. Crawford, resigned to take post-graduate work at the University of Illinois. Arthur J. Mix has been appointed assistant botanist during the absence of M. T. Munn for a year's post-graduate work at the Michigan College. Adin H. Horton, for 25 years an employee of the station and most of this period computer and mailing clerk, died December 9, 1915.

Ohio State University and Station.—County farm bureaus have been established in Marion, Highland, Sandusky, and Miami counties under the direction of M. C. Thomas, Joseph P. Hershberger, K. C. Egbert, and George R. Eastwood, respectively.

Beginning January 1, the regular series of station bulletins will be limited to technical reports of its investigations and will be sent only to libraries, persons engaged in scientific research, and others who may specifically request them. In their stead there will be sent to the general mailing list a Monthly Bulletin, reporting the progress of the different departments of the station's work in nontechnical form.

Recent station appointments include L. L. Rummell as editor; W. L. Robison and D. G. Swanger as assistants in animal husbandry; and Oliver Gossard and O. H. Smith as assistants in soil investigations.

Oregon College and Station.—H. P. Barss, research assistant in plant pathology, has been appointed professor of botany and plant pathology, succeeding H. S. Jackson whose resignation has been previously noted.

South Carolina College and Station.—Dr. F. M. Rolfs, associate professor of botany and bacteriology and associate botanist and plant pathologist, has resigned to accept an appointment at the Oklahoma College and Station. Dr. Roy C. Faulwetter, of Columbia University, has been appointed associate botanist and plant pathologist in the station, giving all his time to station work, and W. B. Aull, assistant to the botanist, has been appointed assistant professor of bacteriology exclusively for teaching work.

Nursery and Market Garden Experimental and Research Station in Hertfordshire.—This station was established in 1914 by the Nursery and Market Garden Industrial Development Society, Ltd., which is empowered to conduct experiments in the cultivation and preparation for market and sale of fruits, flowers, vegetables, trees, shrubs, plants, and similar products in Great Britain, to carry on educational work connected therewith, and to disseminate information regarding these industries.

The management of the station is vested in a committee chosen by the Lea Valley and District Nurserymen's and Growers' Association, Ltd., the committee of the Lawes Agricultural Trust, and the County Councils of Essex and Hertfordshire, including among others, H. E. Armstrong, J. B. Farmer, S. U. Pickering, E. J. Russell, J. A. Voelcker, and T. B. Wood, and with A. B. Lister as director. It has been financed mainly by contributions of about $4,000 from local nurserymen and others for permanent endowment, and $1,250 per annum for five years for maintenance, grants of $6,500 from the Development Fund for land and buildings and $3,000 per annum for maintenance, from the Hertfordshire

County Council of $1,500 for endowment, and from the Essex County Council of $250 per annum for maintenance.

A tract of several acres in Hertfordshire at Turner's Hill, Chestnut, Waltham Cross, has been purchased, and an office, botanical and chemical laboratories, and an extensive range of experimental greenhouses completed in the fall of 1914. Station work was begun January 11, 1915, special prominence being given to studies of truck diseases and the use of bacterized peat and the effect of greenhouse temperatures on tomatoes, as well as the standardization of soil for proposed manurial tests. It is also expected to appoint a chemist for studies of the physical factors of the house and soil atmosphere and its effect on vegetation, and to take up physiological studies of factors influencing growth, transpiration, respiration, assimilation, etc., under greenhouse conditions.

Necrology.—Prof. Francis M. Webster, chief of cereal and forage crop investigations of the Bureau of Entomology of this Department, died January 3 at Columbus, Ohio, where he had been attending the recent meetings of the American Association for the Advancement of Science.

Professor Webster was born at Lebanon, N. H., August 8, 1849, and began his entomological work in 1882 as assistant state entomologist of Illinois. From 1885 to 1888 he was professor of economic entomology at Purdue University and consulting entomologist to the station from 1888 to 1891, as well as special agent of this Department from 1884–1892, and entomologist of the Ohio Station from 1891–1902. He had also served as assistant in the biological survey of Illinois, and had made entomological trips to Australia and neighboring countries.

Professor Webster was a fellow of the American Association for the Advancement of Science and ex-president of the Association of Economic Entomologists, and a member of numerous other entomological and scientific organizations. He was one of the pioneers in investigations in entomology as applied to agriculture in this country, and was widely recognized as an authority on insects affecting cereals and truck crops.

Miscellaneous.—*The Plant World* announces two prizes of $50 each for the best papers embodying original work in soil physics. The right is reserved to withhold both prizes if no worthy papers are submitted, or to combine the prizes for the rewarding of a paper of exceptional merit. The conditions governing the award will be similar to those employed in connection with the prizes offered in 1915 for papers on the water relations of plants. The contest terminates December 1 and the announcement of the award will be made not later than March 1, 1917.

A tract of about 29,000 acres of land in eastern Idaho, near Spencer and adjoining the Targhee National Forest, was set aside by President Wilson, October 30, 1915, to be utilized by the Bureau of Animal Industry as the United States Sheep Experiment Station, with general range studies in sheep raising on a large scale.

Dr. Hugo Fischer has been appointed acting head of the chemical and bacteriological department of the Kaiser Wilhelm Department for Agriculture at Bromberg.

Dr. Albert Stutzer, professor of agricultural chemistry at Königsberg, is to retire from active service with the present semester.

Beginning with the present academic year Vassar College is offering courses in horticulture and landscape gardening.

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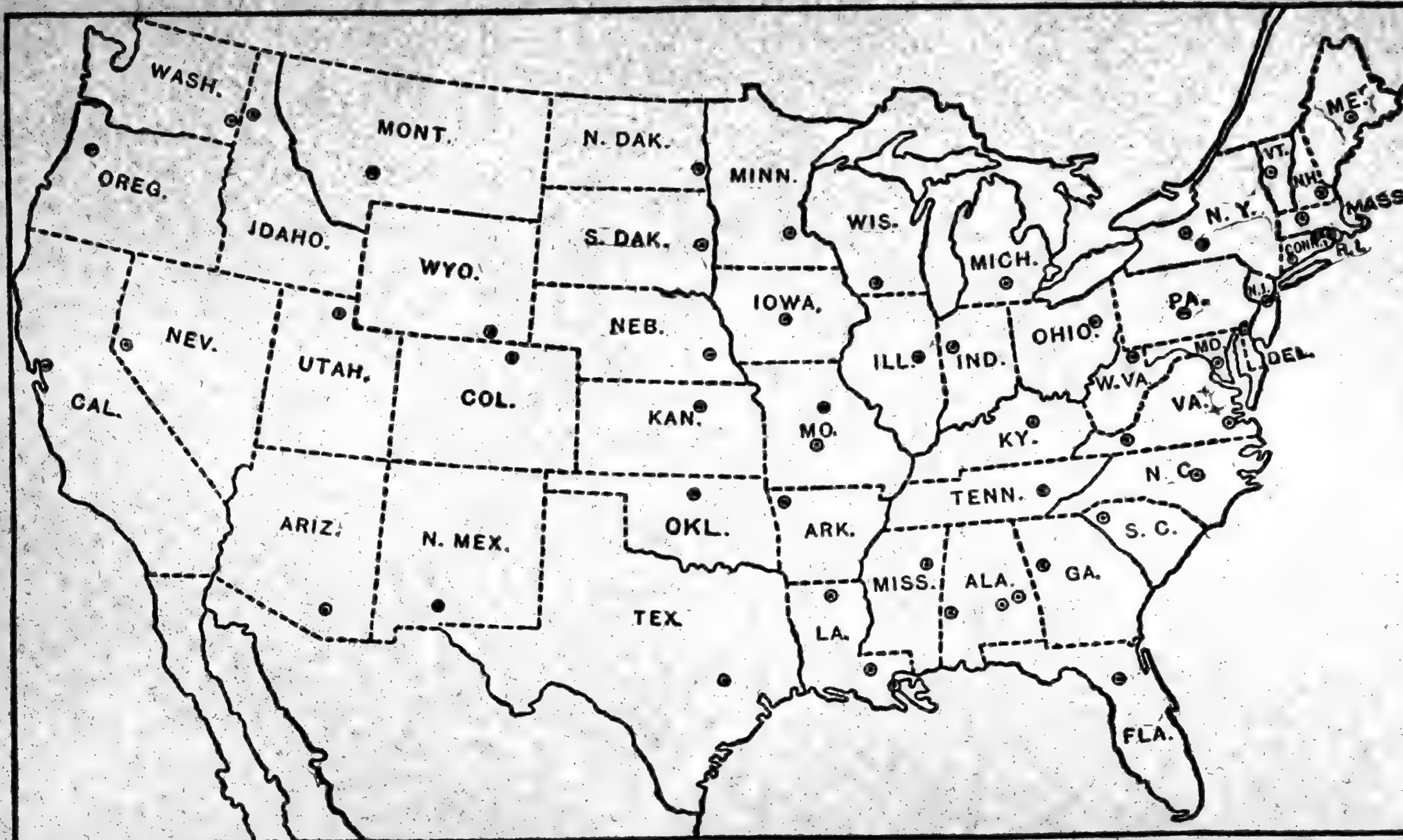

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U. S. DEPARTMENT OF AGRICULTURE.

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Fruit Station: *Mountain Grove;* Paul Evans.[a]
MONTANA—*Bozeman:* F. B. Linfield.[a]
NEBRASKA—*Lincoln:* E. A. Burnett.[a]
NEVADA—*Reno:* S. B. Doten.[a]
NEW HAMPSHIRE—*Durham:* J. C. Kendall.[a]
NEW JERSEY—*New Brunswick:* J. G. Lipman.[a]
NEW MEXICO—*State College:* Fabian Garcia.[a]
NEW YORK—
State Station: *Geneva;* W. H. Jordan.[a]
Cornell Station: *Ithaca;* B. T. Galloway.[a]
NORTH CAROLINA—
College Station: *West Raleigh;* } B. W. Kilgore.[a]
State Station: *Raleigh;* }
NORTH DAKOTA—*Agricultural College:* T. P. Cooper.[a]
OHIO—*Wooster:* C. E. Thorne.[a]
OKLAHOMA—*Stillwater:* W. L. Carlyle.[a]
OREGON—*Corvallis:* A. B. Cordley.[a]
PENNSYLVANIA—
State College: R. L. Watts.[a]
State College: Institute of Animal Nutrition; H. P. Armsby.[a]
PORTO RICO—
Federal Station: *Mayaguez;* D. W. May.[b]
Insular Station: *Rio Piedras;* W. V. Tower.[a]
RHODE ISLAND—*Kingston:* B. L. Hartwell.[a]
SOUTH CAROLINA—*Clemson College:* J. N. Harper.[a]
SOUTH DAKOTA—*Brookings:* J. W. Wilson.[a]
TENNESSEE—*Knoxville:* H. A. Morgan.[a]
TEXAS—*College Station:* B. Youngblood.[a]
UTAH—*Logan:* E. D. Ball.[a]
VERMONT—*Burlington:* J. L. Hills.[a]
VIRGINIA—
Blacksburg: W. J. Schoene.[c]
Norfolk: Truck Station; T. C. Johnson.[a]
WASHINGTON—*Pullman:* I. D. Cardiff.[a]
WEST VIRGINIA—*Morgantown:* J. L. Coulter.[a]
WISCONSIN—*Madison:* H. L. Russell.[a]
WYOMING—*Laramie:* C. A. Duniway.[c]

[a] Director. [b] Agronomist in charge. [c] Acting director.

EXPERIMENT STATION RECORD.

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U. S. Department of Agriculture—Con.

[a] Printed in scientific and technical publications outside of the Departments.

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EXPERIMENT STATION RECORD.

VOL. XXXIV. ABSTRACT NUMBER. No. 3.

RECENT WORK IN AGRICULTURAL SCIENCE.

AGRICULTURAL CHEMISTRY—AGROTECHNY.

Enzyms of apples and their relation to the ripening process, R. W. THATCHER (*U. S. Dept. Agr., Jour. Agr. Research, 5 (1915), No. 3, pp. 103–116*).—From the results of investigations reported from the Minnesota Station it appears that the only enzyms which participate in the changes in the carbohydrates of apples during the ripening process are oxidases. The juice of the apple contained no diastases, and it appears, therefore, that after the starch disappears from the apples the diastases also disappear. None of the apples which were available for the investigations contained any starch. No invertase was found, which confirms the findings of Warcollier (E. S. R., 19, p. 307). The presence of none of the other common types of carbohydrate-splitting enzyms could be determined.

The author concludes that the fact that the changes which take place during the ripening are inhibited by surrounding the fruit with an atmosphere of carbon dioxid, as shown by the experiments described, is easily explained on the basis of their being oxidase changes, since it is a well-known fact in enzymology that the presence of a large excess of the end products of a reaction generally inhibits the action of the accelerating enzym in an increasing degree as the proportion of the end product increases. Carbon dioxid is undoubtedly the end product of oxidase activity, so that the result obtained is what would naturally be expected. Small amounts of esterase and protease which were found in the ripening apples indicate the possibility of the hydrolytic decomposition of the small quantity of essential oil and of protein material contained in the flesh of the apple during the ripening process or subsequent breaking down of the tissue.

An examination was also made of apple seeds. Diastases were found to be present in considerable amount; invertase, absent; emulsin, present in considerable amount; lipase, present in small amount; protease, present (hydrolyzed both albumins and peptone); and oxidases, absent.

The solidifying and melting point of mutton tallow and its fatty acids, R. MELDRUM (*Chem. News, 109 (1914), No. 2827, pp. 49–51*).—This investigation was undertaken to ascertain the relationship between the melting and solidifying points of mutton tallow and its fatty acids. The thermometer-bulb method was used for the melting point, and the solidifying point was determined by Dalican's method.

The author has demonstrated that mutton and beef tallow do not possess a constant solidifying point for any given sample. Experimental data submitted

show that solidification takes place from about 6 to 8° C. below the melting point. Also, previous to solidification the thermometer falls to from 10 to 12° below the melting point. This characteristic property is common to all mixtures of solid and liquid glycerids but does not hold good for mixtures of solid and liquid fatty acids. The tallows used in all the observations contained free fatty acids and therefore free gycerin, and whether small amounts of these modify the solidifying point and are the cause of low zeros or erratic "rises" is being investigated.

The solidifying point of mutton tallow.—II, R. MELDRUM (*Chem. News, 111 (1915), No. 2883, pp. 98, 99; abs. in Jour. Soc. Chem. Indus., 34 (1915), No. 6, p. 288*).—"Solid glycerids were separated from mutton tallow by treatment with ether, and their solidifying point determined by Dalican's method, the mass being melted at 80° C. and stirred while cooling from 55 to 47°, and the thermometer then fixed at 1.5 in. from the bottom of the tube. The solidifying point ranged from 49.7 to 51°, with a rise of from 3.4 to 4°. The presence of suspended matter and the method of stirring had no influence on the results, and no secondary stationary point was observed. Erratic variations of the 'zero' solidifying point (i. e., the temperature to which the thermometer falls before the rise commences) and of the rise were much smaller in the case of the solid glycerids than of the original tallow, this being attributed to the influence of the greater proportion of liquid glycerids in the latter. Such variations do not occur with mixtures of stearic and oleic acids. Fluctuations of the melting points of glycerids appear to be due to errors of manipulation, while the solidifying point is influenced by the speed of crystallization. Constant results are obtained when a constant amount of substance crystallizes per unit of time. Glycerids require supercooling to start rapid crystallization, and each glycerid appears to have a specific 'zero' point of incipient solidification. When glycerids (especially mixtures of solids and liquids) are supercooled, the latent heat of fusion may be insufficient to raise the temperature of the mass to the normal solidifying point."

The presence of an amino group in wool, K. GEBHARD (*Färber Ztg., 25 (1914), No. 14, pp. 279–283; abs. in Jour. Soc. Chem. Indus., 33 (1914), No. 17, p. 856*).—The author found that when wool was treated with formaldehyde, as described by Kann,[a] it still retained its power of reacting with nitrous acid to form a true diazo compound. Wool probably contains two substances, an amino acid and a colloidal substance loosely attached to the amino group of the acid. It is thought that Kann, who maintains that wool does not contain an amino group, probably split off and coagulated the colloid, leaving the amino acid free with an active amino group.

Nephelometry (photometric analysis).—I, History of method and development of instruments, P. A. KOBER and SARA S. GRAVES (*Jour. Indus. and Engin. Chem., 7 (1915), No. 10, pp. 843–847, figs. 10*).—A general review of the subject.

A modified method for determining carbon-free ash in plant substances, G. E. BOLTZ (*Jour. Indus. and Engin. Chem., 7 (1915), No. 10, pp. 859, 860*).—It is claimed that the usual method for determining ash in plant substances generally introduces an error, due to the presence of carbon dioxid in combination with bases present. This is especially true of an ash containing large amounts of calcium, magnesium, and potassium. A procedure which has proved very satisfactory is as follows:

"Weigh from 2 to 10 gm., depending upon the material, into a platinum dish. Ignite over a low flame until most of the carbon is burned off. Cool, cover the dish with a watch glass and add through the lip of the dish about 20 cc. of hot

[a] Färber Ztg., 25 (1914), No. 4, pp. 73–75.

distilled water. Filter into a weighed 200 cc. Erlenmeyer flask, wash the residue three or four times with hot water, replace the filter paper with residue in the platinum dish, dry, and ignite until practically all the carbon is consumed. Transfer the remaining ash to the Erlenmeyer flask with hot water, using a policeman to loosen any particles that may adhere to the dish. Evaporate the moisture and dry the ash at 110° C. until thoroughly dry; weigh. The weight minus the weight of the flask represents the crude ash.

"Connect the flask containing the crude ash to an apparatus [described elsewhere [a]] for determining the carbon dioxid, treat the contents of the flask with 80 cc. of distilled water free from carbonates and 20 cc. of dilute hydrochloric acid (1:10). Aspirate purified air through the apparatus while liberating the carbon dioxid. Boil for 30 minutes and absorb the gas in 50 cc. of a 4 per cent solution of sodium hydroxid. Drain the sodium hydroxid solution out of the absorption tower and wash the remaining caustic solution out of the tower with 250 cc. of CO_2-free water. Exactly neutralize with normal hydrochloric acid, using phenolphthalein as indicator. Add 2 drops of methyl orange solution (1 gm. in 1,000 cc.) and titrate with twentieth-normal hydrochloric acid until the color of the methyl orange is just changed. From the number of cubic centimeters of twentieth-normal hydrochloric acid used subtract blank: 1 cc. twentieth-normal hydrochloric acid=0.0022 gm. carbon dioxid. The titration where phenolphthalein is used is ignored. The carbon, sand, and silica are determined as outlined on page 22 in Bulletin 107, U. S. Bureau of Chemistry [E. S. R., 20, p. 512]. The carbon dioxid plus the unburned carbon and sand is subtracted from the weight of crude ash. The remainder represents the amount of carbon-free ash."

A Kjeldahl distillation apparatus, J. M. Pickel (*Jour. Indus. and Engin. Chem., 7 (1915), No. 9, pp. 787–789, figs. 3*).—An apparatus, which the author states he has used for a number of years with excellent results, is described. Claims are made that it is simpler, more flexible, and less costly than that described by Holmes (E. S. R., 33, p. 10).

Titration of nitrates with ferrous sulphate, F. C. Bowman and W. W. Scott (*Jour. Indus. and Engin. Chem., 7 (1915), No. 9, pp. 766–769*).—A simple and reliable method for the titration of nitrates, as shown by analytical data submitted, was devised by the authors. The method is based on the well-known ferrous sulphate test for nitrates. The procedure recommended is as follows:

Dissolve 176.5 gm. of ferrous sulphate heptahydrate in 400 cc. water, and stir into this gradually 500 cc. of dilute sulphuric acid 1:1. Cool the mixture and make up to 1,000 cc. The order of mixing given should be followed, for a different order is apt to cause precipitation of an iron sulphate that can not be redissolved.

Either potassium bichromate or nitric acid may serve for a standard. With the former, the strength of the iron solution is estimated by Penny's method, 0.2 cc. being allowed for the end point in titrating nitrates.

"A more satisfactory method of standardizing is to titrate a nitric acid solution of known strength under the exact conditions in which the iron solution is to be used. For this, dilute 41 cc. of the usual 70 per cent laboratory nitric acid to 1,000 cc. and titrate with normal caustic alkali. Use 10 cc. of the dilute nitric acid to standardize the ferrous sulphate solution in the manner described above."

For titration the sample should be chosen to contain 0.3 to 0.6 gm. of nitric acid. For the most accurate work, the titration should be on practically the same quantity of nitric acid as was used in standardizing the solution.

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[a] Jour. Indus. and Engin. Chem., 4 (1912), No. 8, p. 611.

"Place 100 cc. concentrated sulphuric acid, free from nitrates, in a 250 cc. beaker set in a large porcelain casserole full of cold water. Run the sample in slowly from a 10 cc. pipette to the bottom of the acid, stirring meanwhile with the pipette; this procedure is designed to prevent loss of nitric acid fumes. Run in the ferrous sulphate solution slowly in a fine stream with constant stirring until the solution turns from yellow to faint brown or pink. Then rinse out the pipette by sucking it full of the acid and draining it and continue titrating cautiously to the first color change. The end point is clear to 0.05 cc. and different operators should agree within 0.1 cc.

"The casserole of water serves the double purpose of cooling the acid and making the end point much clearer. It is sometimes necessary to halt the titration and let the solution cool. The temperature should never exceed 60° C. and is better kept below 40°. Let the burette stand five minutes before taking the reading, as the ferrous sulphate solution drains very slowly."

With care the error in the method does not exceed $\frac{1}{300}$ of the quantity of nitric acid estimated. It is not suitable for traces. Constancy of conditions is important. Chlorates, bromates, iodates, chlorids, bromids, and iodids interfere but nitrites do not when sulphuric acid is used as a medium. The method is recommended for technical purposes and results of tests made are given.

Molybdic acid recovery, C. G. ARMSTRONG (*Jour. Indus. and Engin. Chem.*, 7 (*1915*), *No. 9, p. 764, fig. 1*).—Numerous methods for the recovery of molybdic acid were tried but discarded on account of their impracticability or unnecessary consumption of expensive reagents. A method was finally devised as follows:

The waste molybdic acid residues were filtered from any phosphomolybdate precipitate that it contained. This was most conveniently accomplished by means of an asbestos suction filter.

"The filtered solution is then placed in a 5-liter German flask and supported inverted over a large evaporating dish on a sand bath, allowing but a small amount of the solution in the dish. This method allows a large amount of liquid to be evaporated with little attention. The flask may be refilled until the precipitate of molybdic anhydrid, which forms in the bottom of the evaporating dish, becomes too bulky.

"Remove the flask and evaporate the solution in the dish until it begins to foam considerably and there is just enough solution left to cover the precipitate and keep the iron in solution. Cool, dilute with one-half volume of cold water, allow to settle, and decant. Wash the precipitate thoroughly a couple of times with water by decantation to remove the iron salts and treat with enough 1:1 ammonium hydroxid to fill the dish. A dark brown precipitate will form, due to precipitated iron.

"The whole is then washed into a large flask, warmed slightly, and allowed to stand a couple of hours with an occasional shaking to facilitate solution. When all is in solution, or after two hours, the liquid may be filtered off by a siphon, sand, and asbestos suction filter into another flask. Arrange the suction tube so that the lower portion of the solution, containing the precipitate, will be the last to come upon the filter, thus preventing troublesome clogging of the filter by the iron precipitate. Add 5 per cent of the original amount of ammonium hydroxid to the solution to make up for that used in precipitating the iron."

This solution contains the molybdic anhydrid as ammonium molybdate and, when the specific gravity of it is taken with a hydrometer at 25° C., by referring to an accompanying curve the percentage of molybdic anhydrid present may be found and the proper amount of fresh molybdic anhydrid added to bring the concentration up to any required strength. The solution of ammonium molybdate may be evaporated to dryness and then roasted to 600° to molybdic anhydrid. The recovery in these tests, which were carried out on large amounts of residues

under actual working conditions, was 93 per cent, and the recovered molybdic acid obtained by evaporation and roasting at 600° tested chemically pure in all cases.

The cost of recovery is practically nothing.

The effect of ammonium chlorid upon ferric and aluminum hydroxids during ignition, H. W. DAUDT (*Jour. Indus. and Engin. Chem., 7 (1915), No. 10, pp. 847, 848*).—Experimental work cited indicates that the washing of ferric and aluminum hydroxids free from ammonium chlorid is unnecessary. No loss occurred in either hydroxid by washing with ammonium-chlorid solutions of concentrations of 1 per cent or lower, and it was found to be advantageous to have small quantities of ammonium chlorid present in the wash waters on account of the tendency of the precipitate to become colloidal when electrolytes are altogether absent. By precipitating the aluminum hydroxid in hot solution, boiling the suspended precipitate for approximately 45 seconds and transferring to the filter immediately, no difficulty was experienced in getting easy and rapid filtration.

Determination of dextrin and sugars in food products, C. F. MUTTELET (*Ann. Falsif., 7 (1914), No. 69, pp. 372–380*).—Continuing the work previously noted (E. S. R., 31, p. 18), a procedure is given which includes also the determination of dextrin.

In the method 20 gm. of the preserve is transferred with the aid of tepid water to a 200 cc. flask, then lead subacetate is added for the purpose of defecation, care being taken to avoid an excess (should an excess be used it may be removed with bicarbonate of soda). Water is added to make the volume to 200 cc., and the solution is decolorized with animal charcoal. The reducing sugar is determined in the solution so obtained and the results (p) are calculated as invert sugar to 100 cc. of solution. The amount of reducing sugar present after inversion (q=sugar in 100 cc. of solution after inversion) is then found. This is followed by determining the sugar after inversion with hydrochloric acid for 20 minutes in the autoclave at 110° C. This is calculated as grams of sugar in 100 cc. of solution and is represented by m. The rotation of the original solution is established at 20° in the 200 mm. tube and expressed as D.

The amount of sucrose (S) present in the solution is found as follows:

$S=[0.95\ (q-p)]$, and corresponds to a rotation (c) of ($1.33°S$).

The quantity of dextrin $\Delta=[0.90\ (m-q)]$ corresponds to a rotation of $\delta=3.9\ \Delta$ degrees.

The sum of the weight of glucose (G) and levulose (L) corresponds to a rotation of d.

$d=D-(c+\delta)$ from which is obtained L and G.

$$L=\frac{(106\times p)-d}{2.93}$$

$G=(p-L)$ gm.

The results of some trials with fruits, jelly, marmalade, comfits, and sirups with the method are given.

Note on the determination of sulphates in bread, C. D. HOWARD (*Jour. Indus. and Engin. Chem., 7 (1915), No. 9, p. 807*).—After reviewing former methods for the determination of sulphates in flour and bread, the author states that he has adopted the following procedure:

"Twenty-five gm. of the air-dry ground bread was digested for two to four hours on the top of the water bath at gentle heat with 200 cc. of 5 per cent hydrochloric acid, the mixture being well stirred at intervals. After cooling, the clear extract was decanted through a folded filter, the residue washed two

or three times with warm water, and the filtrate precipitated as usual with barium chlorid. As a rule, the precipitated sulphate was clean. In those cases where it showed contamination with organic matter, the barium sulphate, after ignition and weighing, was treated in the Gooch with a few cubic centimeters of acidulated hot water, followed by a second ignition and weighing."

No experimental data are given.

The determination of fat in ice cream by the Babcock method, C. A. A. Utt (*Jour. Indus. and Engin. Chem., 7 (1915), No. 9, p. 773*).—The author concludes that the Babcock method if properly conducted is simple, desirable, and accurate. The use of hydrochloric-acetic acid mixture was not found satisfactory in most cases. The procedure outlined in the usual Babcock method, using a mixture of sulphuric and acetic acids, was found to give excellent results on commercial ice cream.

The method is outlined in detail. Some analytical data are submitted in which checks were obtained in ice cream mixtures made up according to various formulas within from 0.04 to 0.15 per cent of the amount occurring in the mixtures.

A device for the successive determination of the solids and fat in milk and other fluids, A. Seidenberg (*Jour. Indus. and Engin. Chem., 7 (1915), No. 9, pp. 769–773*).—The advantages and disadvantages of the methods in use for the determination of fat in milk are discussed.

The author has devised a new method for the determination of the total solids and the fat in milk, using a single sample. The apparatus used is an oxidized copper wire gauze 7 by 10 cm., of 40 or 60 mesh, ridged or plaited laterally with from 18 to 20 ridges about 2 mm. high and about 2 mm. apart. The two long sides of the gauze are bent up for 2 mm. in such a way as to close the opening of the grooves formed by the ridges. The gauze is placed upon two ridges 2 mm. high running the length of a dish made of heavy tin foil on the surface of which are numerous cross-sectional indentations. The dimensions of the dish are 7 by 10.5 cm. Three of the sides are 4 mm. high, and the fourth (a long side) 8 mm. The sides are not joined at the corners.

In making determinations of solids and fat the wire gauze and dish are first weighed accurately and then 4 or 5 gm. (or other weighed quantity) of milk is evenly distributed drop by drop by means of a pipette over the entire gauze. The milk is then dried to a constant weight in an air bath at 100° C. and the device weighed to find total solids. For the determination of fat the gauze is rolled into a conical form along with the dish, the high side and ridges of the dish being first flattened out. After the gauze and dish have been rolled up the high side at one end is folded up, the other end being left open, and the device introduced into a Soxhlet or other extraction apparatus. After extraction it is dried to constant weight, the loss in weight being fat.

The containing dish is used but once in order to obtain the best results. The wire gauze, however, may in some cases be used again by burning off the milk solids, washing out the ash, and drying thoroughly in the flame.

The method is also recommended for the determination of solid matter in such substances as glues, varnishes, shellacs, oils, tanning materials, etc.; sirups, flavoring extracts, and other saccharine products; and for the extracts of vinegars, wines, beers, and other distilled liquors.

The method has been thoroughly tested and compared with other methods and has been found to give most satisfactory results.

Comparative fat determination in cheese with Dr. Herramhof's and Dr. Hesse's volumetric method and the gravimetric method of Ratzlaff, H. Nilges (*Milchw. Zentbl., 43 (1914), No. 16, pp. 425–430*).—The results obtained by the Herramhof method (E. S. R., 33, p. 314) were slightly higher than those by

the Hesse method and the Kooper method (E. S. R., 31, p. 613). The latter methods, however, are easier and quicker. It is thought that the Herramhof apparatus would be of great value if the total solids could be determined with it at the same time, as suggested by the originator.

Desiccation tests made with this and the sea sand method showed great variations. The fat content as determined in the dried cheese mass obtained by the Herramhof and sea sand methods did not show such great variations as did the figures for dry matter, the variations in fat being between 0.03 and 4.37 per cent, with an average of 1.51 per cent, while the average for dry matter was 3.54 per cent.

Fruit by-products, W. V. Cruess (*California Sta. Rpt. 1915, p. 31*).—Methods have been devised whereby clear palatable jellies are produced from oranges and lemons. "One ton will yield approximately 300 gal. or 6,000 6-oz. glasses. Methods of clearing orange and lemon juice were tested. Fining with 8 to 12 lbs. of Spanish clay, settling, and filtration were found satisfactory. Small amounts of sulphurous acid prevent darkening and the development of a 'musty' taste."

The practical application of improved methods of fermentation in California wineries during 1913 and 1914, F. T. Bioletti and W. V. Cruess (*California Sta. Circ. 140 (1915), pp. 14, figs. 8*).—A continuation of the enological investigations previously noted (E. S. R., 17, p. 183; 23, p. 209; 25, p. 716) is reported, confirming previous observations.

It was found that the use of pure yeast and sulphurous acid can be applied successfully on a practical scale and yields more perfect fermentations and sounder wines. A new method is outlined in detail, and analyses of the wines reported. Wines made by the improved method kept a great deal better at warm temperatures than the spontaneously fermented wine. Sulphurous acid alone gave as sound wines as where pure yeast was used in addition to the sulphurous acid. The amount of sulphurous acid left in the wine did not exceed 64 per cent of the limit allowed under the Food and Drugs Act and averaged only about 21 per cent.

METEOROLOGY.

Work in agricultural meteorology (*Trudy Selsk. Khoz. Met., No. 14 (1915), pp. 150, figs. 10*).—This report contains the following articles: The Importance of Agricultural Meteorology from the International Point of View, by G. Azzi (see below); The Influence of Meteorological Factors on the Yield of Grain in the Province of Bologne, by G. Azzi (see p. 208); The Influence of the Principal Meteorological Factors on Winter Rye, by R. G. Zalenskiĭ; Halos of the Sun and Moon as Indexes of Weather Changes, by E. A. Khvol'son; A Simplified Deduction of the Formula for Adiabatic Changes in an Ascending Current, by P. I. Brounov; Problems and Results of Agricultural Meteorology, by V. K. Gauer; and Programs of Meteorological-Agricultural Observations.

The importance of agricultural meteorology from the international point of view, G. Azzi (*Trudy Selsk. Khoz. Met., No. 14 (1915), pp. 3–18*).—Defining agricultural meteorology as the correlation of the sum of the meteorological factors and plant growth, the author points out the necessity for securing uniformity of methods in (1) the determination of the critical periods of different plants in different localities; (2) the preparation of charts showing the probable distribution of droughts, precipitation, and frost; (3) the determination of zones of good, medium, and poor yields as correlated with the meteorological conditions; and (4) the extension of the zone of good yields by better adaptation of crops to climatic conditions.

The influence of meteorological factors on the yield of grain in the Province of Bologne, G. Azzi (*Trudy Selsk. Khoz. Met., No. 14 (1915), pp. 19–47, fig. 1*).—Studies made according to the Russian method of determining critical periods in plant growth are reported, the results showing that the critical period for wheat as regards rainfall occurs during the two ten-day periods immediately preceding heading. If, during the first of these ten-day periods, the precipitation is not less than 30 mm., or if this period is dry and during the preceding period the rainfall was not less than 60 mm., the probability of agricultural yield is excellent even if no more rain falls until autumn.

Meteorological record for 1912, R. Withycombe (*Oregon Sta., Rpt. East. Oreg. Sta., 1911–12, pp. 32, 33*).—A summary by months of observations on temperature (maximum, minimum, and average), precipitation, cloudiness, and wind at the substation at Union during 1912 is given. The total precipitation for the year, 17.74 in., was about normal for the region.

Climate and meteorology [of Canada], R. F. Stupart (*Canada Yearbook, 1914, pp. 128–139*).—The main climatic and meteorological characteristics of the different provinces of Canada are noted and tables of temperature and precipitation at various places in the Dominion during 1914 are given.

The temperature of western and equatorial Africa, R. Chudeau (*Compt. Rend. Acad. Sci. [Paris], 161 (1915), No. 5, pp. 106–109*).—Available data on this subject are collated and analyzed with reference to different regions in this area.

Atmospheric pressure in western and equatorial Africa, R. Chudeau (*Compt. Rend. Acad. Sci. [Paris], 161 (1915), No. 12, pp. 351–354; abs. in Rev. Sci. [Paris], 53 (1915), I–II, No. 19, p. 479*).—The data obtained from 13 stations are summarized showing the mean, monthly, and annual pressure with the diurnal variation.

The distribution of rainfall in western Africa, H. Hubert (*Compt. Rend. Acad. Sci. [Paris], 160 (1915), No. 18, pp. 606–608*).—This article deals briefly with the sources and types of rainfall of this region and the phenomena which control it. It is held that in general the distribution depends upon the displacement of the zone of equatorial calms.

Electric niagaras, A. Beckerich (*Jardin, 28 (1914), No. 657, pp. 203–205, figs. 2; 29 (1915), Nos. 664, pp. 272, 273, figs. 2; 665, pp. 281–283, fig. 1; 666, pp. 290, 291*).—This article discusses briefly the theories of the formation of hail, the principles of construction of the towers used for reducing the electric tension of the clouds and thus dispersing hailstorms, the action of these towers, and the question of their efficiency as means of hail protection.

The general conclusion is that past experience with this means of hail protection is not conclusive and that the whole question of hail formation and hail protection needs further investigation. The lines along which this investigation should be pursued are indicated.

A new chemical hygrometer, E. K. Rideal and A. Hannah (*Analyst, 40 (1915), No. 467, pp. 48–54, figs. 3; abs. in Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases, 6 (1915), No. 4, pp. 439, 540*).—What is stated to be a simple and accurate means of measuring the moisture content of the air, based upon its absorption by sulphuric acid, is described.

Bacteria in city, country, and indoor air, W. W. Browne (*Science, n. ser., 42 (1915), No. 1080, p. 351*).—This is an abstract of a paper presented at the recent meeting of the Society of American Bacteriologists which reported results of bacteriological examinations of 134 samples of city air, 85 of country air, 87 of office air, and 47 of factory air.

It was found that the number of bacteria was larger and the fluctuations greater in the air of occupied spaces than in that of open spaces. The micro-

organisms developing at 20° C. on gelatin were generally found to be under 50 per cubic foot, rarely over 100 per cubic foot. The number of those developing at 37° was rarely over 50 per cubic foot. The number of streptococci was 10 per 100 cu. ft.

SOILS—FERTILIZERS.

Soil reconnoissance in Alaska, with an estimate of the agricultural possibilities, H. H. Bennett and T. D. Rice (*U. S. Dept. Agr., Advance Sheets Field Operations Bur. Soils, 1914, pp. 202, pls. 38, maps 4*).—This report, issued September 20, 1915, deals with the soils and agricultural possibilities of the Cook Inlet-Susitna, Yukon-Tanana, and Copper River regions of Alaska.

The Cook Inlet-Susitna region includes approximately 6,000 square miles of land, comprised in the plain-like country and adjacent bench lands bordering Cook Inlet from Kachemak Bay northward and extending up the Susitna and Matanuska valleys. "At least one-third of this area . . . consists of arable land possessing topographic and drainage characteristics and chemical and physical properties quite favorable to farming. . . . The remainder of the lowland country largely represents Muskeg or marsh, isolated areas in the Muskeg, and areas of unfavorable topography. Extensive drainage operations will be required to reclaim the marsh land, and to make available the included well-drained land." "The Cook Inlet-Susitna benches and lowlands embrace a considerable variety of soils ranging in composition from silt loam through fine sand to peat, and in drainage, from well-drained bench land to water-soaked marsh." Exclusive of Muskeg and muck, there are two broad soil divisions in the region, namely, bench land soils and stream bottom soils. Of these the Knik loam and fine sandy loam soils are the most extensive.

The Yukon-Tanana region comprises (1) the lowlands of the lower Tanana River, from the vicinity of McCarty to the Yukon River, known as the Tanana Flats; (2) the lowlands of the Yukon River, chiefly comprised in the Yukon Flats; and (3) the area of highlands or hill country between the Tanana and Yukon lowlands, the Yukon-Tanana uplands. "The lowest estimated area of available farming land in this region is 4,500,000 acres. In this estimate only 50 per cent of the 7,000 square miles of the lower Tanana bottoms is included and less than 25 per cent of the uplands lying to the north of the Tanana River." The soils of the Tanana bottoms are mainly sandy and silty and are flat and mostly well drained. In the hills north of the Tanana bottoms is an area of approximately 500,000 acres of deep silt loam soil which is considered to be the best soil in Alaska. These soils are well drained and have good moisture-holding capacity. "There are still larger areas of other cultivable soils on the slopes of the hill country." In the Yukon-Tanana region seven of the principal soil types are mapped of which the so-called Gilmore soils and stony mountainous areas, Tanana soils, and Yukon soils are the most extensive.

The Copper River regions include the Copper River Basin and the Copper River Delta. The former is a broad expanse of plain-like country almost completely inclosed by mountains and containing a large area north of Copper Center the topography of which is favorable for agriculture. "The principal soil here, however, is not so favorable, being predominantly of a clayey character, and so stiff and probably cold-natured that it would be difficult to till." The soil of the Copper River Delta "represents a mixture of the recent glacial outwash, chiefly gravel and sand, with the sand and silt of the Copper River alluvium."

A comparison of Alaska with Finland and parts of Siberia is also included.

Soil survey of Bullock County, Alabama, H. C. SMITH and W. E. WILKINSON (*U. S. Dept. Agr., Advance Sheets Field Operations Bur. Soils, 1913, pp. 50, fig. 1, map 1*).—This survey, made in cooperation with the State of Alabama, was issued July 15, 1915. It deals with the soils of an area of 388,480 acres in southeastern Alabama, which is divided physiographically into two parts, the "prairie region," comprising the northern part, and the "sandy-lands region," the southern part. The topography of the prairie region ranges from hilly and even rough to undulating, while that of the sandy-lands region varies from a broad, sandy upland plain to somewhat hilly country. The rougher areas are excessively drained, while the lower uplands and the terraces require artificial drainage. A large total area is subject to erosion.

The soils of the county are broadly grouped into upland soils derived from lime-bearing rocks and from unconsolidated sandy deposits of a later age, second terrace soils originating from rather recent stream action, and first bottom soils subject to annual inundation and still in active process of formation. Thirty-two soil types, representing 17 series and 1 miscellaneous type, are mapped, the Susquehanna clay and fine sandy loam predominating. The Norfolk series, including sand, fine and coarse sand, and fine sandy loam, is second in extent.

Soil survey of Escambia County, Alabama, R. T. A. BURKE, J. M. SNYDER, A. M. O'NEAL, JR., and F. W. KOLB (*U. S. Dept. Agr., Advance Sheets Field Operations Bur. Soils, 1913, pp. 51, fig. 1, map 1*).—This survey, made in cooperation with the State of Alabama and issued July 17, 1915, deals with the soil characteristics of an area of 604,160 acres in southern Alabama, the topography of which varies from level or gently rolling to rolling. The drainage is mainly into the Conecuh River.

Physiographically the county is divided into uplands extending to the river and stream terraces, and lowlands which include the terraces and bottom lands of the rivers and streams. The upland soils, derived through processes of weathering from beds of sand, sand and gravel, or sandy clay, vary from gravelly sand through sand and gravelly loam to sandy loam, fine sandy loam, and clay, and with the exception of two types are generally well drained. The lowland soils are of alluvial origin. Including swamp, 28 soil types, of 13 series, are mapped, of which the Ruston fine sandy loam is the most extensive. The Norfolk series is second in extent, the Norfolk fine sandy loam being widely developed throughout the county. It is stated that one of the chief needs of the soils is organic matter.

Soil survey of the Fort Lauderdale area, Florida, M. BALDWIN and H. W. HAWKER (*U. S. Dept. Agr., Advance Sheets Field Operations Bur. Soils, 1915, pp. 52, pls. 9, fig. 1, map 1*).—This survey, issued July 31, 1915, deals with the soils of an area of 225,600 acres, comprising a relatively narrow strip of territory extending from the Atlantic Ocean east of Fort Lauderdale to Lake Okechobee.

The topography of the area is generally flat and nearly level and natural drainage over most of the area is entirely inadequate, the only well-drained portion being near the coast. The soils are classed as cumulose soils and soils derived from marine sediments. The former, comprising muck and peat, are composed mainly of vegetable matter in various stages of disintegration and decay, with the admixture of various quantities of extraneous inorganic material and are by far the most extensive. The loss on combustion of typical sample of muck was found to average about 50 per cent. The loss on combustion of peaty muck was 65 to 84 per cent of the weight of the oven-dried sample. Peat had an ash content varying from 6 to 16 per cent. In addition to the peat and muck cumulose soils, 7 other soil series are recognized in the area, these, however, covering only about 10.5 per cent of the area.

Soil survey of Hernando County, Florida, G. B. JONES and T. M. MORRISON (*U. S. Dept. Agr., Advance Sheets Field Operations Bur. Soils, 1914, pp. 30, pls. 4, fig. 1, map 1*).—This survey, issued September 30, 1915, deals with the soils of an area of 302,720 acres on the western coast of Florida, the topography of which ranges from level to hilly. There is no well-defined drainage system in the county, most of the surface water escaping through sinks and underground streams. The soils of the county are largely sandy, although there are some areas of clayey soils and a number of areas having a clay subsoil. The soils are grouped into four divisions, namely, (1) imperfectly drained flatwoods, (2) undulating to rolling areas, (3) depressed areas, and (4) tidal overflow soils. Including muck, swamp, tidal marsh, and rock outcrop, 16 soil types are mapped, of which the Norfolk fine sand is the most extensive, covering nearly half the county.

Soil survey of the Indian River area, Florida, C. N. MOONEY and M. BALDWIN (*U. S. Dept. Agr., Advance Sheets Field Operations Bur. Soils, 1913, pp. 47, pl. 1 fig. 1, map 1*).—This survey, issued July 31, 1915, deals with the soils of an area of 218,240 acres along the middle east coast of the Florida Peninsula, the surface features of which range from low coastal swamps and level flatwoods to dune-like coastal ridges. The drainage is mainly effected by seepage. The soils of the area range from cumulose deposits through sands, or a mixture of sand, gravel, and shell fragments, to calcareous clay. They are grouped with reference to origin into cumulose soils, unconsolidated marine material, and residual or partly residual soils. Seventeen soil types, of 8 series, are mapped, of which the St. Lucie sand is the most extensive.

Soil survey of Terrell County, Georgia, D. D. LONG and M. BALDWIN (*U. S. Dept. Agr., Advance Sheets Field Operations Bur. Soils, 1914, pp. 62, fig. 1, map 1*).—This survey, made in cooperation with the Georgia State College of Agriculture, was issued September 13, 1915. It deals with the soils of an area of 213,760 acres in southwestern Georgia, the topography of which ranges from level to rolling. The county is said to be, as a whole, well drained.

The soils of the county are alluvial and upland, the latter being derived mainly from unconsolidated clays, sands, marls, and consolidated limestone. The soils are divided according to texture into sands, fine sands, loamy sands, sandy loams, loams, clay loams, and clays. Including muck and swamp, 35 soil types, of 15 series, are mapped, of which the Greenville series, including seven types, is the most extensive.

Soil survey of Wilkinson County, Mississippi, W. E. THARP and W. M. SPANN (*U. S. Dept. Agr., Advance Sheets Field Operations Bur. Soils, 1913, pp. 52, pl. 1, fig. 1, map 1*).—This survey, made in cooperation with the State of Mississippi, was issued July 17, 1915. It deals with the soils of an area of 426,880 acres in southwest Mississippi, the western part of which consists of level delta lands and the remainder mainly of rolling to hilly uplands dissected by innumerable drainage lines.

Throughout the uplands of the county the prevailing surface material is loess. It is from 20 to 50 ft. deep on the western hills, but gradually thins toward the east until its average depth is but a few feet. The loess is generally underlaid by a red sandy formation. In the eastern section soils derived in part from the underlying sands and clays are found. Including rough broken land, meadow overwash, and river wash, 17 soil types, of 9 series, are mapped, of which the Memphis silt loam is the predominating type, covering over half the county.

Soil survey of Douglas County, Nebraska, A. H. MEYER, E. H. SMIES, T. M. BUSHNELL, R. R. SPAFFORD, R. R. BURN, and C. W. SMITH (*U. S. Dept. Agr., Advance Sheets Field Operations Bur. Soils, 1913, pp. 48, fig. 1, map 1*).—This

survey, made in cooperation with the Nebraska Soil Survey and issued June 14, 1915, deals with the soils of an area of 211,840 acres in middle-eastern Nebraska, which includes three distinct topographic divisions: (1) Uplands, (2) old alluvial terraces, and (3) first bottom lands. The surface of the upland is rolling to rough and extremely dissected. The county has well-established drainage to the southeast.

The upland and terrace soils are of silty texture, while the bottom lands vary in texture from loose incoherent sand to heavy clay. The upland is covered by a bed of loess which varies from a thin mantle to 100 ft. in depth. Fifteen soil types, of 7 series, are mapped, of which the Knox silt loam is the most extensive, followed by the Marshall silt loam.

Soil survey of Saunders County, Nebraska, A. H. Meyer, E. H. Smies, T. M. Bushnell, R. R. Spafford, R. R. Burn, and R. J. Scarborough (*U. S. Dept. Agr., Advance Sheets Field Operations Bur. Soils, 1913, pp. 52, fig. 1, map 1*).—This survey, made in cooperation with the Nebraska Soil Survey and issued June 10, 1915, deals with the soils of an area of 487,040 acres in eastern Nebraska, the topography of which varies from flat in the stream bottoms and terraces to extremely dissected in parts of the upland. "There are three distinct topographic divisions: (1) The uplands, derived from loessial and glacial material; (2) the alluvial terraces, deposited at a time when the streams were flowing at a higher level; and (3) the first bottom lands, embracing the recent alluvium of the Platte River and its tributaries." The county is drained by the Platte River and Wahoo and Salt creeks.

In texture, most of the upland and terrace soils are silty, while those of the bottom lands vary from a loose incoherent sand to heavy clay. Including 3 miscellaneous types, 18 soil types, of 10 series, are mapped, of which the Shelby silt loam, the Marshall silt loam, the Waukesha silt loam, and the Wabash silt loam are, in their order, the predominating types.

Soil survey of Rowan County, North Carolina, R. B. Hardison and R. C. Jurney (*U. S. Dept. Agr., Advance Sheets Field Operations Bur. Soils, 1914, pp. 47, fig. 1, map 1*).—This survey, made in cooperation with the North Carolina Department of Agriculture, was issued September 29, 1915. It deals with the soils of an area of 330,240 acres in west-central North Carolina, the topography of which is prevailingly rolling. The greater part of the county consists of broad interstream areas. The area includes a great variety of soils adapted to a wide range of crops. The upland soils are of sedimentary origin and the bottom soils of alluvial origin. Twenty-seven soil types, including 10 series, are mapped, of which the Cecil series is the most important, covering over half the county.

Soil survey of Paulding County, Ohio, H. G. Lewis and C. W. Shiffler (*U. S. Dept. Agr., Advance Sheets Field Operations Bur. Soils, 1914, pp. 29, fig. 1, map 1*).—This survey, made in cooperation with the Ohio Experiment Station, was issued September 8, 1915. It deals with the soils of an area of 264,320 acres in northwestern Ohio, the topography of which is level to slightly rolling. The drainage is to the northeast through the Maumee and Auglaize River systems and there are many large tracts between rivers that have no well-developed natural drainage.

The soils have a marked uniformity, are of glacial and lacustrine origin, and range in texture from sand to clay. Eight soil types, of 8 series, are mapped, of which the Clyde clay is the most extensive, covering over three-fourths of the area. The Clyde clay consists mainly of swampy, dark-colored soils, while the lighter-colored soils are included in the Miami and Belmore series, and the alluvial soils in the Genesee series. "In general the darker-colored soils of the county are fairly well supplied with organic matter, while the lighter-colored soils are in need of humus. The Miami soils are apparently deficient in lime."

"The soils most in need of tile drainage are the Clyde clay and the Miami clay and clay loam, though almost all of the types are materially improved by tiling."

Soil survey of Muskogee County, Oklahoma, G. B. JONES, C. VAN DUYNE, E. SCOTT, and H. W. HAWKER (*U. S. Dept. Agr., Advance Sheets Field Operations Bur. Soils, 1913, pp. 43, pls. 2, fig. 1, map 1*).—This survey, issued August 4, 1915, deals with the soils of an area of 520,960 acres in eastern Oklahoma, which includes three physiographic divisions, namely, the prairie plains, of nearly level to rolling topography; the wooded uplands, a part of the Ozark Uplift, and consisting of a rugged escarpment with a nearly level crest, deeply intersected by an extensive system of small and intermittent streams; and bottoms and terraces along the Arkansas and Canadian rivers. The county is drained by the Arkansas and Canadian rivers through numerous tributaries.

The county has a great diversity of soils, which are grouped in three classes as residual prairie soils, mountain soils, and alluvial bottom land soils. Forty soil types of 15 series are mapped, of which the Gerald series is the most extensive. The prairie soils include the Gerald, Oswego, Spearfish, Bates, and Leslie series and rock outcrop; the mountain soils include the Hanceville and Dekalb series and rough stony land; and the bottom soils comprise the Yahola and Osage series, occupying the first bottoms, and the McLain, Reinach, Brewer, Muskogee, Shawnee, and Teller series, occurring on second bottoms to high terraces.

Soil survey of Jackson County, Tennessee, R. F. ROGERS and J. H. DERDEN (*U. S. Dept. Agr., Advance Sheets Field Operations Bur. Soils, 1913, pp. 29, fig. 1, map 1*).—This survey, made in cooperation with the Tennessee Geological Survey, was issued July 29, 1915. It deals with the soils of an area of 201,600 acres in the northeastern part of middle Tennessee. The county lies in the limestone section and includes the highlands of the uneroded Highland Rim section, a larger area of slope land between this and the stream bottoms, a large extent of stream bottom lands, and considerable steep gullied land lying along the sloping areas. The surface drainage is rapid.

The soils of the county are classed in accordance with the physiographic sections. Eighteen soil types, of 6 series, are mapped, of which the Clarksville series, including gravelly loam, stony loam, and silt loam, is the most extensive, followed closely by the Hagerstown series. Applications of organic matter and phosphatic fertilizers are beneficial. Erosion represents a serious soil problem in the area.

Soil survey of Jefferson County, Texas, W. T. CARTER, JR., L. R. SCHOENMANN, T. M. BUSHNELL, and E. T. MAXON (*U. S. Dept. Agr., Advance Sheets Field Operations Bur. Soils, 1913, pp. 47, pls. 3, fig. 1, map 1*).—This survey, issued November 10, 1915, deals with the soils of an area of 588,800 acres in southeastern Texas, which is divided into uplands comprising the greater part of the county; a flat, almost level coastal prairie; and lowlands consisting of a broad belt of marshy land. Practically all the drainage is into Sabine Lake and thence into the Gulf. The soils are grouped into two distinct divisions, (1) old upland soils of the coastal prairie, and (2) recent soils, which are coastal marsh or sea flats subject to overflow by salt water at extreme high tides, and recent bottom lands along the streams and marshy lowlands in the upland portions of the county. Including 4 miscellaneous soils, 21 soil types of 9 series are mapped, of which the Lake Charles clay, silty clay loam, and very fine sandy loam and the Lomalto clay are the predominating types.

Reconnoissance soil survey of south-central Texas, A. E. KOCHER ET AL. (*U. S. Dept. Agr., Advance Sheets Field Operations Bur. Soils, 1913, pp. 117, pls. 5, figs. 4, map 1*).—This survey, issued June 12, 1915, deals with the soils

of an area of 14,576,000 acres, including nineteen counties, in south-central Texas. The greater part of the area lies in the rough stony section of the Edwards Plateau. "With the exception of the small level tract in Crockett and Schleicher counties, the area is as thoroughly drained as any section of equal size in the State, there being more than twenty rivers within its limits carrying water the entire year. In fact, drainage throughout much of the area is excessive. . . .

"Most of the soils are derived from calcareous materials and are relatively high in lime and humus. Those derived from crystalline rocks are low in both these constituents. The soils of the Coastal Plain section consist of the dark-colored Houston types, the gray-colored Blanco and Laredo types, and the reddish-brown Miller and San Antonio types. On the uplands of the Edwards Plateau are found the reddish-brown to black soils of the Crawford series, the gray to light-brown soils of the Brackett and Miles series, and large areas of rough stony land. On the terraces and in the valley basins are found the Frio and Roswell series and the reddish-colored soils of the Padernales series. In the Llano-Burnet basin are found four groups of soils derived from crystalline materials. These are the reddish-colored Tishomingo soils, the most varied group in the area; the Pontotoc soils, a bright-red series derived from sandstone; the grayish-brown Lancaster series; and a miscellaneous group called Katemcy soils." Forty soil types are mapped, of which the Crawford stony clay and rough stony land of the uplands of the Edwards Plateau are the predominating types. "On account of the facilities for irrigation, the most valuable of these soils are the Frio, Laredo, Blanco, and San Antonio types. . . . A large proportion of the types are too rough and stony for cultivation."

Soil survey of the Cache Valley area, Utah, J. W. NELSON and E. C. ECKMANN (*U. S. Dept. Agr., Advance Sheets Field Operations Bur. Soils, 1913, pp. 70, pls. 4, fig. 1, map 1*).—This survey, issued June 26, 1915, deals with the soils of an area of 288,000 acres in the northern part of Utah and extending into Idaho, which is drained through the Bear River. The materials deposited in the valley since its formation are grouped as lake-laid deposits and alluvial deposits. Thirty-eight soil types, representing 12 series, are mapped, of which the Trenton series, including fine sandy loam, clay, loam, silty clay loam, and clay loam, is the most extensive. "The valley is well watered and adapted to a varied agriculture. . . . Some alkali occurs in low, poorly drained places over the valley floor, and a considerable area is in need of drainage."

Soil survey of Stevens County, Washington, C. VAN DUYNE and F. W. ASHTON (*U. S. Dept. Agr., Advance Sheets Field Operations Bur. Soils, 1913, pp. 137, pls. 5, figs. 5, map 1*).—This survey, made in cooperation with the State of Washington and issued November 6, 1915, deals with the soils of an area of 1,531,840 acres in northeastern Washington which is divided into six general physiographic divisions, the Columbia-Kettle River Valley, the Colville-Chamokane Valley, the Spokane River Valley, the Spokane Plateau, the Calispell Mountain Range, and the Huckleberry Mountain Range. The greater part of the county is well drained, a small total area is excessively drained, and a still smaller part is poorly drained.

With reference to the physical factors affecting the agricultural value of the soils, the land is divided into poorly-drained areas, well-drained areas with favorable moisture supply, excessively-drained areas subject to occasional drought, hilly lands, and rough, stony, or mountainous areas, the last two areas being the most extensive, covering 39.6 and 39.2 per cent of the total area, respectively. With reference to origin, the soils of the county are classified as residual soils, glacial drift soils, glacial lake and river terrace deposits, wind laid deposits, alluvial fan and foot slope material, flood plain deposits, organic

matter accumulations, and miscellaneous nonagricultural material. Fifty soil types of 18 series are mapped, of which the Stevens silt loam, the Loon sandy loam and the Waits silt loam glacial drift soils, and the Huckleberry silt loam residual soil are the most extensive agricultural types. Chemical analyses of 100 representative samples of the principal soil types are also reported, the results of which are taken to indicate that the lime content of the soils is generally sufficient, the phosphoric acid and potash contents are fairly high in all except the sandier series, and the organic matter and nitrogen contents are generally low on all but the loamy soils.

Soil survey of Buffalo County, Wisconsin, W. J. GEIB, C. LOUNSBURY, L. CANTRELL, T. J. DUNNEWALD, and O. J. NOER (*U. S. Dept. Agr., Advance Sheets Field Operations Bur. Soils, 1913, pp. 50, fig. 1, map 1*).—This survey, made in cooperation with the State of Wisconsin, was issued October 23, 1915. It deals with the soils of an area of 439,680 acres on the middle-western boundary of Wisconsin, which topographically is divided into undulating to strongly rolling uplands proper, terraces and level valley areas, and overflow plains of the present streams. With the exception of the flood plains of the largest streams the county is naturally well drained.

The upland soils are predominantly silty and the terrace, valley, and flood plain soils have been derived mainly from erosion of the uplands. Including rough stony land, peat, and meadow, 19 soil types are recognized, of which the Boone silt loam is the most extensive and is considered to be one of the most desirable soils in the county. The Union silt loam, second in extent, and the La Crosse series, consisting of dark-colored terrace soils, are also classed among the best agricultural soils of the county.

The productivity relations in different layers of a soil profile, A. VON NOSTITZ (*Landw. Jahrb., 47 (1914), No. 1, pp. 113–152, pls. 2, figs. 2; abs. in Chem. Abs., 9 (1915), No. 12, pp. 1648, 1649; Chem. Zentbl., 1915, I, No. 5, pp. 214, 215; Internat. Inst. Agr.* [*Rome*], *Mo. Bul. Agr. Intel. and Plant Diseases, 6 (1915), No 4, pp. 542–544*).—The work of others bearing on the subject is reviewed and pot culture experiments and chemical, physical, mechanical, and biological studies are reported. The purpose was to determine the relative productive powers of the surface soil and subsoil of different soils and the reasons therefor. The soils used were a loamy sand soil containing little humus, a sandy loam containing much fine sand, and a strong clayey loam containing much humus. All the soils, except the loamy sand, were tested in three layers, the surface soil being the top 25 cm., the subsurface soil the layer from 25 to 50 cm., and the subsoil the layer from 50 to 75 cm. The loamy sand was tested in two layers to a depth of 50 cm.

The results in general showed that the productive power of the soils decreased as the depth of the soil layer tested increased. The difference in productivity between the surface and subsoil was lessened by proper fertilization, but was not removed.

The decrease in crop yield with increasing depth of soil layer tested was not always accompanied by a corresponding decrease in content of mineral matter in the crop, this being in some cases relatively higher in crops obtained from deeper layers. The low relative productivity of the deeper soil layers was found to be caused by less bacterial activity and a smaller content of humus, nitrogen, and soluble phosphoric acid in the deeper layers than in the surface soil.

Effect of temperature on movement of water vapor and capillary moisture in soils, G. J. BOUYOUCOS (*U. S. Dept. Agr., Jour. Agr. Research, 5 (1915); No. 4, pp. 141–172, figs. 11*).—Experiments conducted at the Michigan Experiment Station with light and heavy sandy loam, two types of silt loam, clay, and quartz sand, each of which contained a large number of different moisture contents

ranging from very low to very high, are reported, the purpose being to study the movement of moisture (1) from a warm to a cold column of soil of uniform moisture content, (2) from a moist and warm column to a dry and cold column of soil with and without an air space between the two columns, and (3) from a moist and cold column to a dry and warm column of soil. Only two temperature amplitudes were employed, 0 to 20° C. and 0 to 40°.

It was found that when one-half of a column of soil of uniform moisture content was maintained at 20 and 40° and the other half at 0° for eight hours the percentage of water moved from the warm to the cold soil increased in all the different types of soil with a rise in moisture content until a certain water content was reached, and then decreased with further increase in moisture content. The percentage of moisture at which the maximum thermal translocation of water occurred was different for the different classes of soil, but the percentage of the maximum thermal translocation of water was about the same for all classes of soil for any one of the temperature amplitudes. The percentage of moisture at which this maximum thermal translocation occurred is designated as the "thermal critical moisture content."

These results led to the conclusion that the capillary movement of water in moist soils is not controlled entirely by the curvature of the capillary films, as is generally believed, but also by the unsatisfied attractive forces of the soil for water.

When a moist column of soil was kept at 20 and 40° and a dry column of soil at 0° for eight hours and the two columns were separated by an air space, the percentage of moisture distilled over from the moist and warm column to the dry and cold column of soil was very insignificant for both amplitudes of temperature and was about the same for all moisture contents.

These results led to the conclusion (1) that the amount of water lost from the soil by water vapor is very small, (2) that there is no rising of vapor during the night from the warmer soil below to the cold soil above, and (3) that the water of the dew is not derived from the soil vapor, as is commonly believed.

When a moist column of soil was in contact with a dry column of soil and the former was kept at 20 and 40° and the latter at 0° for eight hours the amount of moisture moved from the moist and warm soil to the dry and cold soil increased with temperature and with moisture content. But when the moist column of soil was maintained at 0° and the dry column of soil at 20 and 40° for the same number of hours there was very little, if any, movement of water from the former to the latter.

These results led to the conclusion that temperature has a very marked influence on the conservation of moisture by mulches.

Effect of temperature on some of the most important physical processes in soils, G. J. Bouyoucos (*Michigan Sta. Tech. Bul. 22 (1915), pp. 63, figs. 34*).—This bulletin reports the studies noted above, and in addition reports experiments on thermo-osmose in soils; the effect of temperature on the percolation of water, the retention of water, and the rate of flow of air in soils; and the effect of temperature changes on the aeration of soils.

No thermo-osmotic phenomena were observed in soils. It was found that in the case of sandy loam, silt loam, clay loam, clay, and muck the rate of water percolation increased with rise in temperature up to about 30° C. and then decreased with further rise in temperature. In the case of sand, however, the rate of percolation increased with a constant rise of temperature. The water-holding capacity of soils and the rate of flow of air through soils decreased with rise in temperature. Temperature changes were found to have a marked influence on soil aeration. "This influence is not due merely to the expansion of

gases of the soil, but also to the absorption of gases by the soil at different temperatures, and to the aqueous vapor."

Soil temperatures as influenced by cultural methods, J. OSKAMP (*U. S. Dept. Agr., Jour. Agr. Research, 5 (1915), No. 4, pp. 173–179, figs. 4*).—Two years' field experiments at the Indiana Experiment Station on three plats in a young apple orchard, which included (1) tillage with a cover crop, (2) straw mulch, and (3) grass land, are reported. The soil temperatures were recorded by means of soil thermographs.

The greatest variation in temperature between plats occurred during the summer months. In the spring and fall there was a transition period in which the temperature differences were less. During the winter the temperatures were quite constant from day to day, with very little variation between plats. In the spring the diurnal range was considerable in the plat under tillage with cover crop and the grass land, but varied little under the straw mulch, which exhibited a very gradual warming up. During the summer season, fluctuations became quite pronounced under tillage and grass, but the straw mulch still maintained its uniformity. During the season of greatest daily range the maximum and minimum temperatures occurred about 10 p. m. and 10 a. m., respectively. In the fall the temperatures and ranges were not radically different from those of spring, except that the general trend of temperatures was reversed.

"In conclusion it may be said that a system of clean cultivation with a winter cover crop is characterized by extreme diurnal and annual fluctuations in soil temperature; that a straw mulch equalized these fluctuations to a marked extent, as does also a grass crop, though in less degree."

The biochemical reduction processes in the soil, C. A. H. VON WOLZOGEN KÜHR, JR. (*Arch. Suikerindus. Nederland. Indië, 23 (1915), No. 13, pp. 501–511; abs. in Chem. Abs., 9 (1915), No. 15, p. 2120*).—The author discusses reduction and oxidation processes in the soil in their relation to soil ventilation and drainage and the presence of aerobic or anaerobic conditions, and draws attention to the so-called sulphate reduction process caused by *Microspira desulfuricans*, which, according to Beijerinck,[a] decomposed gypsum in the presence of organic matter and set free hydrogen sulphid. The hydrogen sulphid was fixed as iron sulphid, which is thought to account for the black color of many tropical soils.

In chemical studies of swamp sugar-cane soils, rich in organic matter, it was found that hydrogen sulphid was set free by treatment with dilute acids and the soil was colored black with iron sulphid. In a solution containing sodium lactate, asparagin, potassium phosphate, magnesium sulphate, and ferric sulphate, when inoculated with the soil and incubated at from 28 to 30° C. for from four to five days, a strong sulphate reduction took place. Other culture media with the same soils produced like results. Organic matter from the soils also reduced ferric to ferrous salts in dilute solutions of hydrochloric or sulphuric acids, as indicated by potassium ferricyanid. It is thought, therefore, that the reducing power of such soils may be measured by the amounts of ferrous iron present after the action in weak acid solution, and that in all probability, since the reduction takes place only in neutral solutions, the appearance of ferrous compounds is due to reduction by anaerobic bacterial activity. It is also thought that cane soils showing local spots with poor growth will have a greater reducing power than those showing normal growth.

Separation of soil protozoa, N. KOPELOFF, H. C. LINT, and D. A. COLEMAN (*U. S. Dept. Agr., Jour. Agr. Research, 5 (1915), No. 3, pp. 137–140*).—Experiments made at the New Jersey Experiment Station are reported, the purpose of which was to separate the different kinds of protozoa from each other and from bacteria.

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[a] Centralbl. f. Bakt., 2. Abt., 1. Bd., 1895, p. 1.

In the separation of flagellates from ciliates an 8-day-old culture of soil organisms was used which was prepared by adding 100 gm. of clay-loam soil to 1 liter of a 10-per cent hay infusion plus 0.5 per cent egg albumin. The numbers of protozoa in the culture solution were counted, and 10 cc. of the solution was then allowed to filter through from one to five thicknesses of sterilized filter paper and the filtrate incubated for 5 days at 22° C. It was found that large ciliates were not able to pass through filter paper at all. The numbers of small ciliates decreased rapidly on increasing the thicknesses of filter paper from two to four. Thus, with four thicknesses of filter paper all the ciliates in the solution were separated from the flagellates and the small ciliates were easily separated from the large ciliates. With five thicknesses of filter paper it was found that 90 per cent of the bacteria in the original solution had passed through the filter, thus leaving the protozoan residue comparatively free from bacteria.

A list of references to literature bearing on the subject is appended.

A review of work on soil inoculation, J. Golding and H. B. Hutchinson (*Rpt. Brit. Assoc. Adv. Sci., 1914, p. 668*).—In this brief review it is stated that "experience has shown that it is not sufficient to have a pure and active culture in order to attain success in soil inoculation, but that the soil itself shall be suitable for the growth and continued existence of the introduced organism, and that the supply of mineral nutrients shall not be the limiting factor in the growth of the plant. . . . Comparative work with pure cultures and inoculation by means of soil which has previously carried a specified leguminous crop has shown in the majority of cases the superiority of the latter, and cultivation in the laboratory has latterly included the use of soil media or soil itself since the organism appears to retain its power of infection to a greater extent in this than in other media. The use of pure cultures possesses advantages on the score of cheapness and convenience, . . . and recent work especially has shown the danger attending transference of plant diseases in soil used for legume inoculation. The relations attending infection of the plant and subsequent mutual existence are very complex, and future experimental work in preparing cultures must aim at reproducing these conditions in order to permit of the production of cultures in active growth and possessing great virulence."

The nitrifying powers of soils as indices to their fertility, C. B. Lipman (*Proc. Soc. Prom. Agr. Sci., 35 (1914), pp. 73–79*).—In a general discussion of this subject the author cites cases of uneven growth of barley on two fields, one of silt loam and the other of humus loam soil. In both cases the better growth was associated with a higher nitrifying power of the soil. From these and other observations he concludes that the nitrifying power of a soil is one of the prime factors in determining its productive power.

Free nitrogen and the higher plants, M. Molliard (*Compt. Rend. Acad. Sci. [Paris], 160 (1915), No. 9, pp. 310–313; abs. in Rev. Sci. [Paris], 53 (1915), I, No. 8, p. 127*).—In experiments with radishes under rigorously aseptic conditions results were obtained from which the author concludes, with Boussingault, that this plant is incapable of utilizing the free nitrogen of the air.

Bacterial toxins in soils, R. Greig-Smith (*Rpt. Brit. Assoc. Adv. Sci., 1914, pp. 667, 668*).—The substance of this article has been previously noted from another source (E. S. R., 31, p. 620).

A systematic scheme for experimental work with fertilizers, A. T. Stuart (*Proc. and Trans. Roy. Soc. Canada, 3. ser., 8 (1915), Sect. III, pp. 167–176, pl. 1, figs. 3; abs. in Chem. Abs., 9 (1915), No. 17, p. 2418*).—This article emphasizes the fact that the number of factors influencing the action of fertilizers is so great as to make it difficult to draw general deductions. The meaning of the law of minimum as applied to fertilizers is discussed and curves illustrating the law are given.

A solid diagram of four dimensions, with a triangle as a base, from which any possible combination of nitrogen, phosphoric acid, and potash may be obtained is described. "The corners of the triangular base represent the elements and the fourth dimension represents the total quantity of all the elements applied. Systematic tests of fertilizers may be made by selecting points on the triangular diagram. Tables are given showing a plan for comparing the relative value of different forms of nitrogen, potash, and phosphoric acid in a three years' rotation."

The determination of availability of nitrogenous fertilizers in various California soil types by their nitrifiability, C. B. LIPMAN and P. S. BURGESS (*California Sta. Bul. 260* (*1915*), *pp. 107–127*).—Laboratory experiments with 29 soil types, from 20 counties in California, showing wide variations in texture and chemical and biological composition and representing a number of the important soil regions of the State, are reported, the purpose of which was to determine the amount of nitrate produced in one month at a constant temperature of 82 to 86° F. from 1 gm. of each of 14 nitrogenous fertilizers thoroughly mixed with 100-gm. portions of soil. The fertilizers used were dried blood, high-grade tankage, steamed bone meal, fish guano, cotton-seed meal, calcium cyanamid, sulphate of ammonia, goat manure, garbage tankage, apple pomace, barnyard manure, green alfalfa, green kelp (Macrocystis), and sewage sludge.

It was found that the most ready and most economical transformation of nitrogen into nitrate occurred in the soils with the so-called low-grade forms of nitrogen fertilizers, like cotton-seed meal, steamed bone meal, goat manure, garbage tankage, and sewage sludge. The so-called high-grade forms of nitrogen, like those of dried blood, high-grade tankage, and fish guano, were not well suited to most of the arid soils, dried blood giving the poorest results, tankage next, and fish guano last. "Whenever soils contain a good supply of organic material and the reaction is alkaline, good results may be expected from these three materials, however."

Ammonium sulphate was the most readily available of the two inorganic forms of nitrogen tested, but is classed with the low-grade nitrogenous fertilizers in this respect.

A preliminary report of greenhouse experiments is also included, in which the soils were used in larger quantities and alfalfa, barnyard manure, and kelp nitrogen used for the nitrifiable material. With one exception, the barnyard manure nitrogen and kelp nitrogen not only gave no increase of nitrates in either the three or seven months' incubation period, but actually induced considerable loss of nitrate from the soil's original content thereof. Alfalfa nitrogen, on the other hand, nitrified in all the soils, though much better in some than in others.

A new form of garbage tankage and also apple pomace were tested in three typical soils. "The latter only induced losses of nitrogen from the soils with which it was tested, but the former gave results which place it in the same class with steamed bone meal, cotton-seed meal, sludge from septic tanks, and goat manure."

These results are taken to indicate that present practice in the use of nitrogenous fertilizers on the soils of the State must be changed and recommendations for their practical use are given.

Calcium cyanamid as a retarder of denitrification, C. LUMIA (*Atti R. Accad. Lincei, Rend. Cl. Sci. Fis., Mat. e Nat., 5. ser., 23* (*1914*), *II, No. 12, pp. 659–662, fig. 1; abs. in Chem. Abs., 9* (*1915*), *No. 15, p. 2120*).—Experiments in which calcium cyanamid was added in amounts varying from 1.5 to 2.5 per cent to 20 cc. of a nutritive solution almost identical with the Giltay solution and

which contained 10 per cent potassium nitrate and 100 gm. of sifted soil are reported.

The results show that the calcium cyanamid in its lowest concentration markedly decreased denitrification. This is thought to explain the more durable and uniform action of calcium cyanamid when used as a fertilizer by other investigators as compared with that of ammonium sulphate and sodium nitrate. It is also thought that inorganic nitrogenous fertilizers can be best utilized when mixed with calcium cyanamid as the latter acts both as a nitrogenous fertilizer and a retarder of denitrification.

Nitrate deposits in southern Idaho and eastern Oregon, G. R. Mansfield (*U. S. Geol. Survey Bul. 620–B (1915), pp. 19–44, pls. 2, fig. 1*).—This paper reports the occurrence of nitrate deposits near Homedale, Idaho, located in the canyons of Sucker Creek and Jump Creek and describes the geography and geology of the region.

The nitrates are always associated with rhyolites. The nitrate occurs in little veinlets which form only a small part of the whole mass. It is thought probable that the Homedale nitrate district is only a part of a much larger niter-bearing area in which locally, as at Sucker Creek, the niter occurs in notable amounts. Enough work has not been done to justify a positive statement regarding the economic value of the deposits.

Preparation of the phosphate extracted by sulphurous acid from Viatka phosphate, V. P. Kochetkov (*Iz Rezul't. Veget. Opytov Lab. Rabot, 9 (1913), pp. 1–20*).—These experiments included tests of the dissolving action of sulphurous acid on the phosphoric acid of phosphorite and the precipitation of the sulphurous solution by (1) evaporation of the solution to dryness, (2) elimination of excess sulphur dioxid by boiling, and (3) precipitation of the phosphate with lime.

It was found that passing a current of sulphurous acid through phosphate suspended in water almost completely dissolved the phosphoric acid. The addition of sulphuric acid to the water in an amount hardly sufficient to decompose the calcium carbonate of the natural phosphate was found to increase the dissolving power of sulphurous acid for phosphoric acid. After evaporation to dryness the residues contained from 22 to 24 per cent of phosphoric acid, of which 57 to 80 per cent was soluble in citric acid. Boiling the solution resulted in the precipitation of about half of the phosphate dissolved, which contained from 23 to 36 per cent of phosphoric acid. The other half of the dissolved phosphate was precipitated by milk of lime, the product containing from 16 to 26.5 per cent phosphoric acid, of which from 86 to 94 per cent was soluble in citric acid.

Speed of solution of compounds of potassium, aluminum, and iron of natural phosphates by mineral acids, I, A. V. Kazakov (*Iz Rezul't. Veget. Opytov Lab. Rabot, 9 (1913), pp. 21–45, pl. 1, figs. 8*).—A review of the fundamental principles underlying the speed of chemical phenomena in general and of the solution of solid bodies in particular and a review of literature bearing on the subject are followed by a report of experiments to determine the rôle of concentration of the solvent, duration of the reaction, degree of pulverization of the phosphate, preliminary roasting of the phosphate, and rapidity of introducing the solvent on the speed of dissolution of potassium, aluminum, and iron of four different natural phosphates. The solvents used in different concentrations were sulphuric, hydrochloric, and phosphoric acids. The results are graphically reported.

Mechanical enrichment of natural phosphates in calcium phosphate, A. V. Kazakov (*Iz Rezul't. Veget. Opytov Lab. Rabot, 9 (1913), pp. 46–56, figs. 7*).—Experiments on six series of typical natural phosphates are reported, the object of which was to determine the effect of grinding and sifting into two fractions and of roasting on the phosphoric-acid content of the two fractions.

The phosphates were ground to a size of from 0 to 0.5 mm. in diameter and were sifted into two fractions below and above 0.08 mm.

The greatest difference in phosphoric-acid content of the two fractions was obtained with the first phosphate series, containing an average of 16 per cent phosphoric acid, where the fine-grained fraction contained 24 per cent phosphoric acid and the coarse-grained fraction 13 per cent. Another series showed only a small difference, and three series no difference. The sixth sample, containing from 26 to 27 per cent phosphate, showed results opposite to those obtained with the first sample, the coarse-grained fraction being the richer in phosphoric acid. The theory underlying this phenomenon is explained. After a preliminary roasting of the first series of phosphates it was found that the fine fraction contained the more phosphoric acid.

The effects of caustic lime and of chalk on soil fertility, H. B. Hutchinson and K. MacLennan (*Rpt. Brit. Assoc. Adv. Sci., 1914, pp. 668, 669*).—This article briefly summarizes the results of investigations discussed in previous reports (E. S. R., 33, p. 622).

Lime and the American vine, G. de Angelis D'Ossat (*Staz. Sper. Agr. Ital., 47 (1914), No. 8, pp. 603–620, figs. 2; abs. in Chem. Zentbl., 1915, I, No. 8, p. 392; Chem. Abs., 9 (1915), No. 12, pp. 1653, 1654*).—References to the work of others bearing on the subject are cited and culture experiments with different vine types are reported, from the results of which it is concluded that chlorosis is not so dependent on the absolute amount of calcium oxid in the soil as on its relative solubility. An apparatus for determining its solubility is described. The crystal system to which calcium oxid compounds belong also influences the solubility, owing to the surfaces presented to attack, calcite dissolving much more readily than aragonite. Other soil constituents, especially clay and humus, influence the solubility of the lime by their effect on the physical and chemical structure of the soil.

The gypsum industry in 1914, G. F. Loughlin (*U. S. Geol. Survey, Mineral Resources of the United States Calendar Year 1914, pt. 2, pp. 261–270, fig. 1*).—This report deals with the production of gypsum in this and other countries and with imports and trade conditions and reviews the history of gypsum production in this country since 1880. The number of short tons of raw gypsum mined in 1914 was 2,476,465, or a decrease of 123,043 tons from the quantity mined in 1913. The quantity of raw gypsum ground and sold for land plaster in 1914 was 52,945 short tons, or a decrease in quantity of 1,870 tons from 1913.

Relation of sulphur compounds to plant nutrition, E. B. Hart and W. E. Tottingham (*U. S. Dept. Agr., Jour. Agr. Research, 5 (1915), No. 6, pp. 233–250, pls. 3*).—Data are presented from greenhouse studies at the Wisconsin Experiment Station with one type of soil (Miami silt loam) indicating that certain plants are measurably increased in their growth by addition of sulphates. Previous experiments have shown that sulphates have little effect as compared with soluble phosphates on the soil flora, and this limits the number of crops for which sulphates may be expected to prove an effective fertilizer. Leguminosæ and Cruciferæ plants made the most marked response to sulphates. In general calcium sulphate was more effective than sodium sulphate. The influence of the sulphates was most marked in the case of root development, the sulphates being particularly effective in this respect with red clover and rape. The well-known benefit of gypsum to red clover is correlated with this special effect of sulphates on root development, as well as the high percentage of protein in clover, making a special demand for sulphur. In these experiments elemental sulphur was generally harmful, this being attributed to incomplete oxidation of the sulphur or to acidity resulting from the formation of sulphuric acid.

A bibliography of 16 references to literature on the subject is given.

Report upon sewage sludge as a manure, H. M. Wilson (*Wakefield, England: West Riding Rivers Board, 1913, pp. 10; abs. in Wasser u. Abwasser, 9 (1915), No. 4, pp. 106–108*).—Analyses of sewage sludge from 22 sources in English cities, with reference to their content of fertilizing constituents, are reported, which show that the nitrogen varied from 0.9 to 3 per cent of the dried sludge, the phosphoric acid from 0.2 to 2.6 per cent and in one case reached 5.5 per cent, and the potash from a trace to 0.8 per cent.

Objection to the use of sewage sludge for fertilizing purposes is due to its high fat content and to its being in a form inconvenient to handle.

Analyses of rocks and minerals from the laboratory of the United States Geological Survey, 1880–1914, F. W. Clarke (*U. S. Geol. Survey Bul 591 (1915), pp. 376*).—This report brings together the results of analyses of rocks and minerals from different parts of the United States made by the U. S. Geological Survey during the past 34 years, together with bibliographic and petrographic data. In the analyses of minerals, sections are included dealing with different phosphates and nitrates. Other data are included which may be of importance in a study of the soils or of natural structural materials of a region.

AGRICULTURAL BOTANY.

Senile changes in leaves of Vitis vulpina and certain other plants, H. M. Benedict (*New York Cornell Sta. Mem. 7 (1915), pp. 281–370, figs. 7*).—On account of its possible bearing on the vitality of plants continuously propagated asexually, the author has conducted an investigation on the possibility of senile changes, the studies being made on leaves of *V. vulpina* and some related plants, especial attention being paid to changes in venation due to increase in age, a brief account of which has been previously noted (E. S. R., 32, p. 728).

In addition, comparisons were made of photosynthetic activity of leaves from young and old plants, respiration, imbibition, cellular changes, effect on nucleus and cytoplasm, etc.

The vein islets in the leaves of *V. vulpina* were found to become smaller as the leaves became older, due to the encroachment of vascular tissue. Leaves borne on plants vegetatively reproduced showed vein islets similar to the plant from which the original cuttings were secured. The same difference with age was found to occur in plants of *V. bicolor*, and apparently the same condition exists in a number of other woody perennials. The decrease in the size of the islets means a reduction in the number of photosynthesizing cells, and the evidence shows a decrease in the rate of photosynthesis as well as in the rate of respiration. The leaves of young vines were found to have a greater capacity for imbibing water than the leaves of old vines, which is believed to be the result of less vascular tissue in the former. There is thought to be an increase in the number of stomata per square millimeter, but a decrease in the size of the stomatal aperture and of guard cells, in the size of the palisade cells, and probably in the mass of nuclei of border parenchyma cells.

Discussing the results as to the significance of senile changes to the problem of the running-out of vegetatively propagated fruits, the author concludes that there are specific morphological changes in the leaves as the plant grows old, which appear to be independent of external conditions, and, so far as preliminary investigation goes, the results tend to support the view that propagation by cuttings does not prevent the progress of senile degeneration in the tissue of the cuttings.

A bibliography is appended.

Radium and plant growth (*Gard. Chron., 3. ser., 58 (1915), No. 1494, p. 102, fig. 1*).—It is stated that in experiments carried out by M. H. F. Sutton the previous year, the germination of rape seed was accelerated when radio-active ores were mixed with the soil, but that in two tests made by him during the summer of 1915 with radium bromid the treated plants, which for about a week outgrew the controls, showed a very unfavorable contrast therewith in about six weeks. This result is regarded as tending to show the noxious or inhibiting effect of γ-rays on plant growth.

Freezing and frost killing of plants, H. PLAHN-APPIANI (*Bl. Zuckerrübenbau, 22 (1915), No. 4, pp. 37–40*).—Discussing the effects of differing degrees of cold and rates of change as noted in several plants, the author holds that the death point in plants due alone to cold as such is generally placed too high.

Light and growth, I, A. H. BLAAUW (*Ztschr. Bot., 6 (1914), No. 8, pp. 641–703, figs. 9*).—The author, describing studies pursuant to those previously noted (E. S. R., 23, p. 724), sums up the principal recent conclusions by stating that a given light stimulus occasions a typical growth reaction in the plant cell which follows certain definite laws, and that the phototropism of Phycomyces, as noted in the experiments described, is the resultant of growth reaction to light on different sides of the cell.

The effects of photodynamically active coloring matters in solutions on plant cells and tissues, J. GICKLHORN (*Anz. K. Akad. Wiss. [Vienna], Math. Naturw. Kl., No. 9 (1914), pp. 140–142; abs. in Bot. Centbl., 126 (1914), No. 25, pp. 662, 663*).—These studies are claimed to have shown that plant cells, with or without chlorophyll or anthocyanin, are subject in different degrees to characteristic forms of injury on exposure to light and fluorescing coloring matters in solution, the injury being due not alone to light directly but also to the heightening of toxic activities by light influence. High degrees of stimulation check the streaming movement of the cell plasma, and continuance of the injurious illumination stops it entirely.

Chlorophyll is thought to have been shown in these experiments to act as a sensibilizer in the process of carbon dioxid assimilation.

Recent chemical investigations of the anthocyan pigments and their bearing upon the production of these pigments in plants, A. E. EVEREST (*Jour. Genetics, 4 (1915), No. 4, pp. 361–367*).—The author summarizes the more important points that have been investigated recently by himself (E. S. R., 31, p. 626) and others regarding the possible relationship between the red, purple, and blue plant pigments (anthocyans) and the yellow plant pigments of the flavone or flavonol class, and he points out their bearing upon some theories previously offered.

A list is given of anthocyan pigments said to have been already isolated in a chemically pure and crystalline condition with the claim that the structure of each has now been definitely established.

It is claimed that the anthocyans always occur as glucosids (anthocyanins); that the same pigment (some anthocyans showing partial exceptions) may exhibit a blue, purple, or red color, according as it exists as alkali salt, pure pigment, or oxonium salt of some acid; that the anthocyans may be obtained from flavonols by reduction followed by spontaneous dehydration; and that glucosids of flavonols can pass, by reduction, to glucosid anthocyans (anthocyanins) without intermediate hydrolysis. It is held that the molecular weights of the anthocyanidins are of the order of those of the flavonols.

Hydrotropism in roots of Lupinus albus, H. D. HOOKER, JR. (*Ann. Bot. [London], 29 (1915), No. 114, pp. 265–283*).—Work previously reported (E. S. R., 31, p. 728) has been followed up with a more detailed study of hydrotropism.

It is stated that roots of *L. albus* are always positively hydrotropic, the reactions occurring only within a relative humidity of 80 to 100 per cent, the minimum effective moisture difference at 20° C. being a fall of 0.2 per cent, the optimum 0.4 per cent, and the maximum 0.5 per cent.

A presentation period was not determined, but reaction becomes perceptible in six hours. The hydrotropic sensitivity resides chiefly in the tip, but also in lesser degree in the parts above.

Of the two factors, one mechanical and the other vital, which are held to determine the reaction of the root to a hydrotropic stimulus, the intensity varies inversely as the former and directly as the latter; the latter predominating under weak, the former under intense stimulus.

Hydrotropism is not regarded as a special case of traumatropism, but as probably equivalent to osmotropism.

A bibliography is given.

The exchange of ions between the roots of Lupinus albus and culture solutions containing one nutrient salt, R. H. TRUE and H. H. BARTLETT (*Amer. Jour. Bot., 2 (1915), No. 6, pp. 255–278, figs. 13*).—In continuation of work by one or both of these authors as previously noted (E. S. R., 26, p. 624; 31, p. 730; 32, p. 824), the authors report that, in recent studies with seedlings of white lupine, roots grown in darkness in distilled water gave up their salts to the water at a varying rate until the plants died from exhaustion of their reserves.

Monobasic potassium phosphate and potassium chlorid solutions act essentially like distilled water in the concentrations herein employed. Solutions of potassium sulphate and potassium nitrate differ from the above only in a slight absorption phase resulting in a minimal net gain in salts to the plant. Absorption and growth in the sodium chlorid occur essentially as in potassium nitrate and potassium sulphate.

Solutions of magnesium nitrate, also those of magnesium sulphate, show a slight but distinct absorption phase resulting in a net gain in salts to the plant. Higher concentrations result in action toxic to the plants, lower in a leakage therefrom.

Calcium nitrate and calcium sulphate were actively absorbed by the roots in all concentrations studied, and apparently enable the plants to retain possession of the salts already present in the plant.

The exchange of ions between the roots of Lupinus albus and culture solutions containing two nutrient salts, R. H. TRUE and H. H. BARTLETT (*Amer. Jour. Bot., 2 (1915), No. 7, pp. 311–323, figs. 3*).—In this investigation seedlings of *L. albus* were supplied with solutions containing mixtures of the nitrates of calcium, magnesium, and potassium in pairs in different proportions and in different total concentrations.

It is stated that when these nitrates are offered in pairs in solutions varying from 120 $N \times 10^{-6}$ to 480 $N \times 10^{-6}$, the roots usually absorb more electrolytes than from the solutions tested singly. In mixtures, as in single solutions, absorption tends to increase when concentration is increased, the magesium salts appearing to offer an exception on account of the narrow range of physiologically useful concentrations of this ion.

In mixtures of the nitrates of calcium and potassium, the unfavorable effect of the latter ion is seen in the large proportion of the former required to give maximum absorption, though the value of a small amount of potassium ion is evident. The absolute amount of calcium seems to be of great influence, a large proportion thereof increasing absorption in the greater dilutions. The favorable influence of this ion is therefore striking in mixed as well as in unmixed solutions.

In mixtures of the nitrates of calcium and magnesium, the greater absorption of the latter ion in comparison with that of potassium appears, as also does the great significance of even a small proportion of calcium.

In unmixed solutions, the magnesium ion is much more favorable to absorption in the weaker concentrations, the potassium ion in the highest, absorption of these two being about equal at a concentration of 360 $N \times 10^{-6}$. Absorption from mixtures exceeds that from either solution singly, except in the weakest concentrations. It appears probable that a large proportion of magnesium is more favorable in weaker concentrations.

On alfalfa laccase, H. H. BUNZEL (*Jour. Biol. Chem., 20 (1915), No. 4, pp. 697–706, fig. 1*).—The author has reported work bearing upon the conclusions of Euler and Bolin (E. S. R., 22, p. 115) regarding the existence of a laccase as an oxidase in *Medicago sativa.* The simplified oxidase apparatus and method previously described (E. S. R., 32, p. 508) were employed.

It is claimed that the effect of salts of strong bases with weak acids on the rate of oxidation of hydroquinone by atmospheric oxygen is due entirely to the concentrations of the hydroxyl ions in such solutions; that there is no hydroquinone-oxidizing oxidase, laccase, in *M. sativa;* and that the accelerating effect of the preparation obtained from *M. sativa* on the rate of oxidation of hydroquinone by atmospheric oxygen is due to the alkalinity of the solution of the salts contained in that preparation.

The germinability of hard leguminous seeds, A. PUGLIESE (*Staz. Sper. Agr. Ital., 48 (1915), No. 1, pp. 77–82, fig. 1*).—A machine and a method are described by which hard leguminous seeds are subjected to the action of a scarifying surface revolving at desired velocities and then tested in germinating experiments. From the results given it appears that the percentages of germination were generally augmented by this treatment, the degree varying considerably according to the species employed.

On the primary and secondary sex characters of some abnormal Begonia flowers and on the evolution of the monœcious condition in plants, C. J. BOND (*Jour. Genetics, 4 (1915), No. 4, pp. 341–352, pls. 2*).—Discussing two types of abnormal flowers as observed in Begonia, the author holds that the presence in the same flower of abnormalities of accessory and of essential floral parts is important as showing that instability of equilibrium in the primary sex elements carries with it in nearly all cases instability of equilibrium of somatic tissues also. It is suggested that the almost universally central and terminal position of the female elements in hermaphrodite flowers is a fact of considerable phylogenetic importance, the female portion of the flower representing the undifferentiated reproductive rudiment from which the male portion has segregated off during the course of evolution.

It is thought that the association between the segregation of primary and that of secondary sex characters is less intimate in plants than in animals.

Factors influencing flower size in Nicotiana with special reference to questions of inheritance, T. H. GOODSPEED and R. E. CLAUSEN (*Amer. Jour. Bot., 2 (1915), No. 7, pp. 332–374, figs. 4*).—The authors report measurements at different ages and under varying conditions of the length of the corolla and spread of the limb as noted in a large number of individuals of Nicotiana, discussing such differences as appear to be associated with culture conditions, hybridization, age of plants, anthesis, and removal of flowers. The general conclusion is reached that measurements of blooms, in order to represent the flower size of a population, must extend over the greater part of the period of blooming normal thereto, or else must cover an identical portion of the flowering period of each plant.

On the origin and behavior of Œnothera rubricalyx, R. R. GATES (*Jour. Genetics, 4 (1915), No. 4, pp. 353–360*).—The author, critically discussing phases of recent work and conclusions as given by Shull (E. S. R., 32, p. 521), claims that the supposedly pure *Œ. rubricalyx* used was in reality a hybrid, and that this should everywhere in that article be treated as a cross between *Œ. rubricalyx* and *Œ. grandiflora.*

Note on the inheritance of heterostylism in Primula acaulis, R. P. GREGORY (*Jour. Genetics, 4 (1915, No. 4, pp. 303, 304*).—The author reports that in experiments with *P. acaulis* the results obtained from different matings were similar to those from previous studies (E. S. R., 25, p. 328) with *P. sinensis.* The inheritance of the characters short style and long style was of a simple Mendelian type, the former being dominant, the latter recessive.

On variegation in Primula sinensis, R. P. GREGORY (*Jour. Genetics, 4 (1915), No. 4, pp. 305–321, pls. 2*).—An account is given of observations upon a race of *P. sinensis* in which it has been found that the characters of normal green, variegated, or pale yellowish green organs containing chloroplasts are transmitted from parent to offspring through the egg cells only, the male gamete apparently playing no part in determining the nature of the zygote in respect of these characters. The facts as noted are thought to support the hypothesis that the plastids of the zygote are derived solely from those present in the unfertilized egg, and that certain characters are inherent in the plastids and are, therefore, handed on to the products of its division.

A proposed modification of the current hypothesis as outlined is thought to explain the maternal transmission of characters as herein discussed.

Parthenocarpy in fruits, A. OSTERWALDER (*Landw. Jahrb. Schweiz, 29 (1915), No. 1, pp. 25, 26*).—Referring to previous studies of Ewert (E. S. R., 21, p. 29; 24, p. 339), the author gives the results of observations during several years on apples and pears of several varieties which showed parthenocarpic fruits in widely ranging percentages. This potentiality is believed to be common even in highly bred varieties and to offer possibilities of considerable practical importance.

New or noteworthy grasses, A. S. HITCHCOCK (*Amer. Jour. Bot., 2 (1915), No. 6, pp. 299–310*).—A list of new or noteworthy grasses resulting from a recent revision of the specimens of grasses from the United States in the National Herbarium is given.

A study of soil fungi from Norway, A. E. TRAAEN (*Nyt Mag. Naturvidensk., 52 (1914), No. 1–2, pp. 19–121, pl. 1, figs. 7*).—From soils of different parts of Norway 120 fungi were isolated and studied. Of these only 7 were very commonly met. These were the new genus Geomyces, with *G. vulgaris, G. sulphureus,* and *G. auratus* n. spp.; the new genus Humicola, with *H. fuscoatra* and *H. grisea* n. spp.; *Trichoderma lignorum;* and *Actinomyces* sp. Rarely occurring forms described are *G. cretaceus* n. sp. and *Chætomidium barbatum* n. sp.

A bibliography of related literature is given.

An automatic transpiration scale of large capacity for use with freely exposed plants, L. J. BRIGGS and H. L. SHANTZ (*U. S. Dept. Agr., Jour. Agr. Research, 5 (1915), No. 3, pp. 117–132, pls. 3, figs. 18*).—In this paper the authors have described an automatic transpiration scale of 200 kg. capacity and 5 gm. sensibility, designed for use in connection with the large culture pots employed by them in their water requirement measurements (E. S. R., 32, p. 127).

A brief review is also given of other classes of transpiration balances.

FIELD CROPS.

[Cultivation of field crops] (*Proc. Internat. Cong. Trop. Agr., 3 (1914), pp. 82–88, 176–187, 272–345*).—These pages contain abstracts of the following papers presented at the London meeting of the International Congress of Tropical Agriculture: The Work of the British Cotton Growing Association, by J. A. Hutton; The Production of Wheat in the Tropics, by A. E. Humphries; The Indian Grain Trade, by F. Noel-Paton; The Wheats of Algeria and Tunis and Their Selection, by E. Baillaud; Recent Work in Australia on the Improvement of Wheat, by F. B. Guthrie; The Production of Maize with Special Reference to South Africa, by J. Burtt-Davy; Burma Rice, by A. C. McKerral; The Sugar Cane in India, by C. A. Barber; The Classification of Indian Sugar Canes, by C. A. Barber; The World's Demand for Cotton and India's Share in Meeting It, by A. Schmidt; Problems in Connection with Cotton Cultivation in Egypt, by G. C. Dudgeon; The Improvement of Cotton by Selection, by J. S. J. McCall; The Cost of Labor as Affecting the Cotton Crop (especially in the United States), by J. A. Todd; Commerce and Science in Cotton Growing, by J. W. McConnel; Cotton Cultivation in the German Colonies, by M. Schanz; Problems Connected with the New Egyptian Cotton Pest, *Gelechia gossypiella*, the Pink Boll-worm, by L. H. Gough; Injurious Salts and the Cotton Plant in Egypt, by V. M. Mosseri; Culture of Cotton in Turkestan Russia without Irrigation, by B. de Fedtschenko; The Experimental Cultivation of Egyptian Cotton in Greece, by C. P. Cosmetato; Variations on Hereditary Factors in Egyptian Cotton, by N. Parachimonas; A Note on the Improvement of Cotton in British India, by G. A. Gammie; The Introduction of American Cotton into Sind Province, India, by G. S. Henderson; Preliminary Notes on Chemical Manures in the Cultivation of the Cotton Plant in Egypt, by V. M. Mosseri; Jute and Its Substitutes, by R. S. Finlow; The Present Position of Fiber Cultivation in the German Colonies, by W. F. Bruck; Scheme for the Establishment of a Practical Method for the Determination of the Commercial Value of Fibers, by C. de Mello Geraldes; The Fiber Industry of Mauritius, by F. A. Stockdale; Results of the Acclimatization in Sicily of *Agave rigida sisilana*, by C. Tropea; The Paper-Making Value of Tropical Fibers, by C. Beadle and H. P. Stevens; The Fibers of the Netherland East Indies; The Fiber Industries of British East Africa, by A. Wigglesworth; The Production of Fine Sea-island Cotton in the West Indies, with Particular Reference to the St. Vincent Industry, by W. N. Sands; The Cotton Industry of the Leeward Islands Colony, by H. A. Tempany; Flower-bud and Boll Shedding of Cotton in the Ilorin Province, Nigeria, by T. Thornton; Cotton Cultivation in Uganda, by S. Simpson; Contribution to the Study of Cottons in the Portuguese Colonies, by C. de Mello Geraldes; Prospects of Cotton Growing in Eritrea, by G. Mangano; The Cotton Industry in the Northern Provinces of Nigeria, by P. H. Lamb; Cultivation of Cotton in the Colony of Eritrea, by G. L. de Capitani; Growing of Cotton and Raising of Cattle in Southern Italian Somaliland, by G. Scasselatti; and Cotton Possibilities in Italian Somaliland and Jubaland (British East Africa), by R. Onor.

[Report of field crop experiments] (*California Sta. Rpt. 1915, pp. 27–29*).—Brief notes are given on variety tests with wheat, oats, barley, alfalfa, corn, and sorghum, cultural tests with wheat and Sudan grass, and the eradication of Johnson grass. Close planting of Egyptian and Durango cotton gave larger yields per acre, smaller plants, and an unimpaired fiber.

Forage crops, J. R. Ricks (*Mississippi Sta. Bul. 172 (1915), pp. 3–23, figs. 5*).—Methods of production that have been found to give satisfactory results and results of cultural tests, are given for Johnson grass, Sudan grass, Bermuda grass, sorghum, alfalfa, crimson clover, cowpeas, and soy beans, and variety

tests of cowpeas and soy beans. Brief discussions of less important grass, leguminous, and miscellaneous forage crops are included.

Results in yields of 2- and 3-year-old alfalfa showed very little difference whether the seed bed had been prepared by plowing 7 in. deep, subsoiling 18 in. deep, or dynamiting from 18 to 24 in. deep.

[Field crop experiments at the Nebraska Station] (*Nebraska Sta. Rpt. 1914, pp. IX–XV*).—"Experiments with corn have shown conclusively that inbreeding tends rapidly to dwarfing and sterilization of the plants, although some seed is produced. Cross-breeding, on the other hand, between different strains which have been inbred for a number of years restores vigor and vitality, resulting in a normal or increased yield of corn." Data giving the results of a study of the water requirements of corn show that the most fertile soil well-manured requires less water to produce a unit of weight of either ear or total plant than a more inferior soil.

Tabulated data show the effect of variety and adaptation of water requirements of crops; effect of the degree of exposure of the potometer upon the growth and water requirements of corn; effect of the size of the potometer upon the growth and water requirements of corn in unmanured and manured soils; the average yield of digestible nutrients of corn, wheat, oats, and soy beans at the station during the six years 1909 to 1914; variety and cultural tests of soy beans; and a summary of comparative yields of corn, wheat, oats, and soy beans at the station for the six years 1909 to 1914.

[Report of the department of agronomy], R. WITHYCOMBE (*Oregon Sta., Rpt. East. Oreg. Sta., 1911–12, pp. 6–32, figs. 17*).—This reports work covering the years 1910, 1911, and 1912 in the improvement by selective hybridization of cereals, grasses, and legumes, the eradication of weeds, and cooperative tests of hybrid barleys and oats.

It is noted that a few superior selections of hybrid barley have been produced, both in point of yield of grain and production of hay. In variety tests with oats Silver Mine had an average 3-year yield of 65.2 bu. per acre, and Sixty-Day a 2-year average yield of 73.9 bu. Black-eyed Marrowfat and Canadian field peas are two varieties recommended as giving the most satisfaction in a field pea variety test.

A cross between the Little Club and Fortyfold varieties produced a selection of very desirable winter wheat which gave a gluten test of 53 per cent as against the general wheat average of 30 per cent. A very desirable spring wheat has been produced by crossing the Durum and Club varieties. A partially beardless strain of rye was produced by crossing and selection in an effort to secure an entirely beardless variety.

Brief notes are given on cultural tests of grasses, legumes, forage, and fiber plants.

It is stated that 22, 24, 26, 28, 30, and 35 per cent solutions of iron sulphate produced no perceptible results when used as a spray in the eradication of morning-glory. The application of a 20 per cent solution of iron sulphate as a spray in fields of oats and barley wilted pigweed considerably within 24 hours, and retarded the growth of mustard to a considerable extent.

The work of the Scottsbluff reclamation project experiment farm in 1914, F. KNORR (*U. S. Dept. Agr., Bur. Plant Indus., Work Scottsbluff Expt. Farm, 1914, pp. 18, figs. 3*).—This bulletin describes weather and crop conditions on this project, in Nebraska, and gives some results in yields per acre of experiments with field crops under irrigated conditions, in continuation of work previously noted (E. S. R., 32, p. 223).

The crops included in these experiments were alfalfa, beets, corn, flax, oats, barley, potatoes, spring wheat, winter wheat, stock beets, and pasture grasses.

Variety tests are reported with wheat, barley, oats, stock beets, and corn. Plats of alfalfa and corn in some of the rotations are noted as having been successfully pastured off with hogs. Grain sorghums do not seem to be successful under irrigation in western Nebraska.

The irrigation and cultural experiments with potatoes gave inconsistent results. "The largest yields were obtained where the soil was kept moist throughout the season, the average yield on land so treated being 296.8 bu. per acre. The poorest-shaped tubers were produced on the plats where the plants were allowed to suffer between irrigations; the average yield in these cases was 244.4 bu. per acre. The lowest yields were obtained by irrigating every other row alternately, the average being 215 bu. per acre."

Seed stock of potatoes from irrigated and dry land has been tested for three years. In this time there has been no material difference in yield associated with differences in the source of the seed, and there has been no apparent running out of the stock.

Three years' work in cultural methods with sugar beets, in which the soil was plowed 4, 8, 12, 16, and 20 in., has revealed no consistent effect on the yield. Different depths and methods of cultivation also showed no material differences in yields.

Seeding alfalfa on unprepared stubble land in August gave as good stands as when the soil was disked or harrowed previous to seeding, and diminished blowing and drifting of the soil.

"Nearly all the grasses seeded came through the winter of 1913–14 in good condition except the Italian rye grass, of which about 50 per cent was winter-killed. One of the pasture mixtures planted in 1913 contained alfalfa seed at the rate of 2 lbs. per acre. This produced enough alfalfa among the grasses to cause bloat in the cows that were on the pasture in 1914."

[Agronomic] work of the Yuma reclamation project experiment farm in 1914, R. E. Blair (*U. S. Dept. Agr., Bur. Plant Indus., Work Yuma Expt. Farm, 1914, pp. 1–18, figs. 4*).—This describes general agricultural, experimental, and climatic conditions (including meteorological data) on this project, covering both sides of the Colorado River in Arizona and California, and gives results of cultural experiments with cotton, alfalfa, grain sorghums, Sudan grass, hemp, flax, and broom corn, continuing previous studies (E. S. R., 32, p. 225). A specially designed sleeping house erected for workmen is briefly described.

Experiments in spacing cotton showed less than 9 in. to be the optimum for distance in the row. It was shown that the main cultural factor determining large yields where cotton is grown under irrigation is the application of water at the proper time, which will be determined entirely by the development and behavior of the plant and which will vary widely with different types of soil.

Wheat, barley, or oats proved good nurse crops for fall planting of alfalfa, although wheat allowed the development of the best stand of alfalfa. White milo maize and dwarf milo maize proved the heaviest yielders of the grain sorghums.

In a thinning-space test with dwarf milo maize "notably higher yields were obtained from 18-in. thinning, while the 3-in. thinning produced the highest percentage of well-filled heads. The 3-in. thinning was also most uniform in time of ripening. This test will be repeated during 1915."

Sudan grass made a good showing, and, although an annual, it has continued to produce for three years. Sudan grass sown for seed spaced in 40-in. rows produced better than in 24-in. rows, while broadcasting at 20 lbs. per acre produced the best yields.

The New Era and Groit varieties of cowpeas are noted as being successful green-manure crops used in securing good stands of alfalfa on light soils, as they increased the water-holding capacity of such soils.

Tabulated data show the amounts of water applied to the various crops and the yields in the several tests.

Influence of the mode of cultivation on the chemical composition of the grains of cereals, S. S. F. TRETIAKOV (*Trudy Poltav. Selsk. Khoz. Opytn. Stantsii, No. 12 (1913), pp. 28–44; abs. in Zhur. Opytn. Agron. (Russ. Jour. Expt. Landw.), 15 (1914), No. 1, pp. 83, 84*).—This gives results of analyses of the grains of winter and spring wheats, winter rye, oats, and barley cultivated under various conditions of fertilization and soil preparation.

With barnyard manure the protein content of spring wheat was increased from 13.48 to 16.13 per cent, of winter rye from 11.69 to 13.38 per cent, of spring wheat from 13.69 to 14.94 per cent, and of oats from 11.38 to 12.81 per cent. The phosphorus content of winter wheat was increased from 0.77 to 1.22 per cent. Leguminous plants, annual and perennial, in preceding the cereals apparently increased the protein content of the latter, the influence of the perennial plants being more pronounced. With corn preceding summer wheat the protein content of the latter increased from 13.38 to 16.25 per cent. Potatoes apparently increased the phosphorus content of the summer wheat immediately following, while mangels produced a contrary effect. With black fallow, nonfertilized, the protein content of winter and summer wheats which followed the winter cereals was increased but not the protein content in rye and oats.

Natural wheat-rye hybrids, C. E. LEIGHTY (*Jour. Amer. Soc. Agron., 7 (1915), No. 5, pp. 209–216, pls. 2*).—In this article the author compares the characteristics of several heads of cereals, found in different fields of wheat, with those of artificial hybrids of rye on wheat.

He concludes that the hybrids found were produced by the fertilization of wheat flowers with rye pollen, basing his conclusion on the following reasons: "(1) The plants were found growing in plats of wheat; (2) no seed has ever been secured by any plant breeder, so far as reported, by fertilizing rye flowers with wheat pollen. In the writer's own experience no less than 80 rye flowers have been pollinated with the pollen from several different kinds of wheat, and no seed has ever been secured. The reciprocal cross is, however, not readily secured. In the writer's experience, again, no less than 173 flowers of different kinds of wheat have been pollinated with rye pollen, and only 4 seeds have been secured, these being in a single head.

"Taking all these things into consideration, it seems evident that the plants found are first-generation hybrids of wheat and rye, the seeds from which they grew having been produced by natural fertilization of wheat flowers with rye pollen. In no other way can the facts be explained."

Winter grain in South Dakota, A. N. HUME, M. CHAMPLIN, and J. D. MORRISON (*South Dakota Sta. Bul. 161 (1915), pp. 227–261, figs. 11*).—This bulletin records experimental work carried on in cooperation with this Department at farms in five sections of the State, representing the different soil and climatic conditions. Climatic and soil conditions for each locality are given.

At Brookings it was found that after several years' trials both winter wheat and winter rye could be grown successfully, the wheat yielding as high as 34.2 bu. per acre and the rye 46.8 bu. Seeding with a double-disk drill on plowed and harrowed land or in high corn stubble gave better results than other methods. Wheat apparently was most profitable when seeded at the rate of 4 to 5 bu. and rye at the rate of 3 pk. per acre.

Winter rye was found to be the most dependable small-grain crop for the vicinity of Highmore, where winter wheat frequently winterkilled. Five pk. of seed planted during September proved to be the best seeding rate and date.

Winter wheat was grown successfully at Eureka on plowed and harrowed land by mulching with a thin layer of straw late in the fall. At Cottonwood winter rye has given better results than wheat, yielding as high as 7.8 bu. per acre in 1914. At the Belle Fourche farm at Newell, as also at Highmore, " the Kharkov and its near relative, the Turkey, have been most successful." "At Newell, as at Brookings, the winter wheat has proved more profitable than the best variety of spring wheat."

Variety test potatoes, E. F. GASKILL (*Massachusetts Sta. Rpt. 1914, pt. 1, pp. 41a, 42a*).—This gives the yields of a 3-year variety test of potatoes (1912 to 1914). Late-variety yields ranged from 118 to 434 bu. per acre and early-variety yields from 89 to 224 bu.

Experiments in the cultivation of rice at the government experiment station, Maha Iluppallama, North-Central Province, G. HARBORD (*Dept. Agr. Ceylon Bul. 21 (1915), pp. 8*).—Different methods of cultivation, the native method of sowing broadcast, dry cultivation, and transplanting, produced, respectively, 47, 33.5, and 60 bu. of rough rice per acre. Results of spacing trials, in which single plants were set 2, 4, 6, 8, 10, and 12 in. apart, showed the 10-in. spacing to give the best monetary returns.

HORTICULTURE.

[Report of horticultural investigations], R. WITHYCOMBE (*Oregon Sta., Rpt. East. Oreg. Sta., 1911–12, pp. 37–40*).—Data are given on a limited spraying experiment conducted to determine the relative value of the first, second, and third sprays in the control of the codling moth. The test indicates that the first spray applied at the time the blossoms fall is the most effective.

A cover crop test was started in the substation cherry orchard during the fall of 1911. Of the crops tested winter rye and hairy vetch proved most satisfactory.

Data are also given on a test of 36 varieties of strawberries conducted during the three seasons, 1910, 1911, and 1912. None of the varieties has proved very satisfactory. Clark Seedling, although not a heavy producer, possessed more quality than any of the other varieties tested. Senator Dunlap, Brandywine, Clyde, and 16 to 1 are given as satisfactory varieties for home gardens, but are not recommended for commercial berries under eastern Oregon conditions.

[Horticultural investigations on the Scottsbluff reclamation project experiment farm, Nebraska, in 1914], F. KNORR (*U. S. Dept. Agr., Bur. Plant Indus., Work Scottsbluff Expt. Farm, 1914, pp. 18, 19*).—Notes are given on acclimatization and variety tests of orchard and small fruits, shade trees and shrubs, and vegetables.

[Report on horticultural investigations at the Yuma experiment farm, 1914], R. E. BLAIR (*U. S. Dept. Agr., Bur. Plant Indus., Work Yuma Expt. Farm, 1914, pp. 18–24, figs. 3*).—In continuation of previous reports (E. S. R., 32, p. 232) a brief report is given of progress made in cultural and variety tests of fruits, nuts, vegetables, and ornamentals during 1914.

Very good results have been secured in transplanting seedling date palms from the nursery to the orchard through careful preparation of furrows for irrigation before planting, care in setting the crowns of the plants well above the earth line, and frequent irrigations. The block of Smyrna-Adriatic fig hybrids came through the winter of 1914–15 with much less frost damage than

in previous years. Propagation of some of these hybrids that produced the best fruits without caprification was started during the year.

A small collection of citrus varieties has been planted. Growth measurements for 1913 and 1914 are given for the various deciduous fruits and nuts being tested. A very destructive, unidentified disease of the pomegranate fruit commonly occurring in the Yuma region has responded somewhat favorably to treatment with Bordeaux. Data are given on variety of tests of onions, tomatoes, and watermelons.

Most of the ornamental trees and shrubs planted on the test grounds in the spring of 1913 have made excellent growth. Desert gum (*Eucalyptus rudis*) trees which were frozen to the ground in January, 1913, had an average height of 13 ft. 2 in. and an average trunk diameter of 2.035 in. when measured in November, 1914. Among the herbaceous flowering plants grown in the region it has been found that few, if any, are superior to the chrysanthemum. Data are given on a test of 14 superior varieties of chrysanthemums. Two species of bamboo, *Dendrocalamus strictus* and *Bambos arundinacea*, are in the garden and passed through the winter with little frost injury.

[Notes on Egyptian horticulture], T. Brown (*Agr. Jour. Egypt, 4 (1914), No. 2, pp. 129–137*).—This article comprises descriptive notes on the culture of Jews' mallow (*Corchorus olitorius*), lablab (*Dolichos lablab*), Arabian tea (*Catha edulis*), and peaches in Egypt.

Report on the Government Horticultural Gardens, Lucknow, for the year ending March 31, 1915, H. J. Davies (*Rpt. Govt. Hort. Gardens Lucknow, 1915, pp. 10*).—In addition to the usual information relative to the administration and management of the garden, notes are given on fruit and food-producing trees as well as other trees and plants of economic value that are being tested.

The Florida plant act of 1915 (*State Plant Bd. Fla. Circ. 1 (1915), pp. 7*).—This circular contains the text of the Florida law enacted to prevent the introduction into and dissemination within the State of insect pests and diseases injurious to plants and plant products of the State and also establishing a state plant board to carry out the provisions of the act.

Standard insecticides and fungicides v. secret preparations, G. P. Gray (*California Sta. Circ. 141 (1915), pp. 4*).—In this circular the author points out the disadvantages in using secret preparations as compared with the use of standard insecticides and fungicides that have been fully tested by the U. S. Department of Agriculture and the experiment stations.

Raising cabbage seed, A. E. Wilkinson (*Country Gent., 80 (1915), No. 44, p. 1654, figs. 3*).—The methods employed in raising and harvesting cabbage seed by a seed grower in New York State are described.

Winter rhubarb, culture and marketing, R. Bland (*San Luis Rey, Cal.: Author, 1915, pp. 69*).—A short treatise on the culture of rhubarb in semitropical parts of the United States for shipment to the early spring markets.

Papago sweet corn, a new variety, G. F. Freeman (*Arizona Sta. Bul. 75 (1915), pp. 453–468, pls. 3, figs. 2*).—In the summer of 1910, a number of wrinkled sweet grains were found in ears of two types of common squaw corn grown by the Papago Indians. The smaller type was extremely hardy and resistant to worms. The larger type was sweeter but more susceptible to injury by worms and ear molds. The two types were bred together and the present bulletin gives the results of four years' work in breeding and selection. Directions are given for growing sweet corn and the control of smut together with notes by A. W. Morrill on ear worms and the corn flea-beetle.

The first year after the cross was made, the average weight of the ripe ears was about 31 gm. After four years of breeding this weight has been doubled and the size and depth of grains has been materially increased. As shown by

analyses, the corn is somewhat sweeter than field corn and is so superior to eastern varieties of sweet corn for planting in the Southwest that it is now offered to the public under the name Papago. Breeding operations are to be continued with the view of developing standard size of ear and grain.

Pollination studies of native corns and several eastern sweet corns indicate that the failure to develop a large number of grains in the sweet corns is probably due to too great a variation between time of silking and time of tasseling. Experiments in desuckering Papago corn indicate that, for this variety, vigor usually carries with it the production of a number of suckers and also a large number of ears per stalk. Variety tests of Papago and various eastern sweet corns resulted in a much greater yield and vigor for the Pagago.

Further experiments on parthenogenesis in tomatoes, G. HÖSTERMANN (*Ber. K. Gärt. Lehranst. Dahlem, 1913, pp. 54–61, fig. 1*).—In continuation of previous investigations (E. S. R., 29, p. 837) the author experimented with several varieties of tomatoes growing both outdoors and in a forcing house. His experiments show in general that the plants will bear more or less fruit even though the stamens are removed before pollination can take place. The parthenogenetic fruit is considerably smaller than normally cultivated fruit.

The work is to be continued with special reference to determining the best cultural conditions for the production of seedless tomatoes.

Fruit culture for South Carolina, C. F. NIVEN (*Clemson Agr. Col. S. C., Farmers' Reading Course Bul. 15 (1915), pp. 86, figs. 16*).—This bulletin comprises a practical treatise on the culture and care of orchard fruits and grapes, including lists of varieties recommended for planting and instructions for the control of insect pests and diseases.

Pollination of fruit trees: Observations and experiments from 1904 to 1912, W. J. MIDDLEBROOKE (*Jour. Bd. Agr. [London], 22 (1915), No. 5, pp. 418–433*).—Pollination experiments were conducted during the 5-year period 1907 to 1912 with different varieties of apples, pears, apricots, nectarines, cherries, peaches, and plums. The trees were established in pots and fruited under glass without artificial heat. Tabular data are given and discussed showing the results obtained with the different fruits by cross-pollination as compared with pollination by the varieties' own pollen and mixed pollen taken from various varieties indiscriminately.

The data secured from this investigation plainly indicate that there is a greater possibility of securing good average crops of fruit where a number of different varieties are grown in proximity to each other. Pollination by bees as tested for one season did not give nearly as good results as those obtained by artificial pollination. Experiments on pollination by wind in which the wind was simulated by the use of bellows produced good results.

The analyses and classification of cider apples, A. TRUELLE (*Rendement, Classement, Caractères, et Traitements des Pommes a Cidre pour la Dessiccation. Argentan, France: E. Langlois, 1915, pp. 19*).—This comprises a large number of analyses of different varieties of French cider apples, including their classification relative to the yield in dry matter; a discussion of the physical, organoleptic, and chemical characters of cider apples; and the special treatment of varieties intended for evaporation.

The cost of producing apples in Maine in 1914, A. K. GARDNER (*Maine Dept. Agr. Bul., 14 (1915), No. 3, pp. 22*).—In this bulletin cost data secured in 1914 relative to the production of apples in nine different orchards are reported. The orchards selected represented differences in soil, variety, age, altitude, distance from the railroad, and other points.

From the data secured as a whole it is estimated that under good orchard management it costs from $1 per barrel to produce apples when the production

is 2 bbls. per tree up to $2 per barrel when the production is only 0.5 bbl. per tree.

Seedless pears resulting from late frosts, G. Höstermann (*Ber. K. Gärt. Lehranst. Dahlem, 1913, pp. 61, 62, fig. 1*).—In this note the author calls attention to the production of seedless pears resulting from the destruction of the flowers by a late frost during the spring of the year 1913.

A page of viticultural meteorology, A. Marescalchi (*Ann. R. Accad. Agr. Torino, 57 (1914), pp. 218–232, figs. 5*).—The results of 40 years' observations on meteorological conditions as related to grape growing at Montferrat are summarized.

Grape pruning: The spur and long cane systems compared, T. J. Maney (*Iowa Sta. Bul. 160 (1915), pp. 211–232, figs. 13*).—This bulletin describes some cooperative pruning experiments carried on near Council Bluffs during the season of 1914 for a comparison of the spur system with the long cane and spur renewal system. Practical instructions in pruning and training both old and young grapevines are given. The bulletin concludes with a bibliography of the more important publications on grape growing.

As determined by the results for one season the vines pruned according to the long cane system yielded on the average 41 per cent more grapes than the spur-pruned vines, indicating that the long cane system must have some good features. It is suggested that the grape grower set aside a few vines and test the system for himself.

Inheritance of certain characters of grapes, U. P. Hedrick and R. D. Anthony (*New York State Sta. Tech. Bul. 45 (1915), pp. 3–19*).—The contents of this bulletin have been previously noted from another source (E. S. R., 33, p. 641).

The green grapes of direct bearers, L. Ravaz and S. Obiedoff (*Prog. Agr. et Vit. (Ed. l'Est-Centre), 36 (1915), No. 38, pp. 275–284, figs. 8*).—The authors point out that there is an almost constant tendency among many of the direct-bearing Franco-American grapes to produce a greater or less number of immature, usually green, berries in the bunches at harvesting time. An anatomical study of a large number of these berries leads to the conclusion that they do not fail to mature on account of lack of fertilization, but rather through exhaustion of reserve material which is withdrawn by other berries in the bunches having a better-developed conductive system.

The hybrid direct bearers in the Côtes-du-Nord region in 1914, A. Desmoulins and V. Villard (*Prog. Agr. et Vit. (Ed. l'Est-Centre), 36 (1915), No. 43, pp. 395–403*).—In continuation of previous data (E. S. R., 31, p. 637) observations are given for the fifteenth year relative to the behavior of a large number of hybrid direct-bearing grapes with special reference to their resistance to disease and adaptation to various soil conditions.

Observations on direct bearers in the Vaudois vineyards, H. Faes and F. Porchet (*Observations sur les Producteurs Directs dans le Vignoble Vaudois. Lausanne: Station Viticole de Lausanne, 1915, pp. 15; Terre Vaud., 7 (1915), Nos. 32, pp. 235–237; 34, pp. 252, 253; 36, pp. 264–266; 37, pp. 273, 274; 38, pp. 279, 280; 40, pp. 294–297*).—This comprises a report of observations covering a number of years relative to the behavior of a large number of direct-bearing grapes in experimental vineyards located under the direction of the Viticultural Station of Lausanne in different parts of the Canton of Vaud. Information is given relative to the resistance of various stocks to mildew, phylloxera, and climatic conditions, and also on the yield and quality of the grapes, must, and wine. The more promising direct-bearing grapes observed in these experiments are discussed at length.

The authors conclude in general that the results thus far secured warrant a continuation of the study of the best hybrid direct bearers.

Vine growing in Italy, S. Cettolini (*Internat. Inst. Agr.* [*Rome*], *Mo. Bul. Agr. Intel. and Plant Diseases, 6 (1915), No. 7, pp. 900–908*).—A statistical review of viticultural conditions in Italy.

Raisin making, F. T. Bioletti (*California Sta. Rpt. 1915, p. 32*).—In confirmation of observations previously reported by the author (E. S. R., 32, p. 235) data are given showing the increase in crop by allowing the raisin grapes to come to a more advanced stage of ripeness before harvesting. Observations in six Muscat vineyards near Fresno indicated a loss from too early picking of from $12 to $22 per acre. The number of pounds of grapes required to make a pound of raisins decreases with advancing ripeness. The station tests indicate that 3.4 lbs. should be the minimum for Muscat and 3.8 lbs. for Sultanina grapes. A favorable average is 3.2 for the former and 3.6 lbs. for the latter. Higher ratios indicate insufficient ripeness or losses in handling.

Temperature of irrigation water as affecting citrus seedlings, C. B. Lipman (*California Sta. Rpt. 1915, p. 17*).—Experiments conducted by the author for a number of years have shown marked effects of retardation of growth of citrus seedlings which received water at temperatures of 39, 44, 50, and even 55° F. The seedlings are stunted in growth and look sickly when they receive water at the first two temperatures. The maximum growth is obtained with water at about 72°. Water of higher temperature shows a slight stunting effect on the orange seedlings which becomes very noticeable at 86°.

Handling and shipping citrus fruits in the Gulf States, H. J. Ramsey (*U. S. Dept. Agr., Farmers' Bul. 696 (1915), pp. 28, figs. 10*).—A practical discussion of the subject, based upon the Department's extensive investigations relative to the handling of Florida citrus fruits (E. S. R., 30, p. 841). It takes up causes of decay in transit; prevention of losses due to decay; what careful handling means; harvesting, packing, and shipping operations; field handling; packing-house handling; methods of shipment; refrigeration; precooling; and cold storage.

Maturity in oranges, J. E. Coit (*California Sta. Rpt. 1915, p. 21*).—A test made by the author of the maturity standard of the U. S. Department of Agriculture of eight parts of total solid to one part of acid in oranges has shown that some districts which were supposed to produce early oranges do not bring them so early to maturity. Furthermore, a variation was found in the total solids to acid ratio of more than 100 per cent between individual oranges in a commercial pack. Oranges on the outside of the tree matured earlier than those on the inside. The juice from different parts of the same orange often varied as much as 15 per cent, there being considerably more sugar obtained from the juice near the navel than near the stem. Consequently it is recommended that a large number of oranges, as well as the juice from both halves of each orange, be included in the sample.

Microcitrus, a new genus of Australian citrus fruits, W. T. Swingle (*Jour. Wash. Acad. Sci., 5 (1915), No. 16, pp. 569–578, figs. 4*).—In continuation of studies of the species of Citrus and related plants (E. S. R., 31, p. 237) the author here proposes and describes another new genus of Australian citrus fruits.

Microcitrus comprises four species, all from eastern Australia, which have previously been described under Citrus. The species described include the finger lime (*Microcitrus australasica*), Garroway's finger lime (*M. garrowayi*), the dooja or Australian round lime (*M. australis*), and the Russell River lime (*M. inodora*). Since the two commonly cultivated species, the dooja and finger lime, are decidedly more hardy than the lime or lemon, it is believed that they may

prove of use in breeding new types of hardy citrus fruits. A number of hybrids have recently been made by the author between the finger lime and the common lime (*C. aurantifolia*).

Experiments on the manuring of tea seedlings, P. H. CARPENTER and E. A. ANDREWS (*Indian Tea Assoc., Sci. Dept. Quart. Jour., No. 4 (1914), pp. 117–143*).—This article describes the results of some preliminary experiments in the manuring of tea nurseries which were carried out during the year 1913 at the Tocklai Experiment Station with the object of testing the value of organic and inorganic manures for the development of tea seedlings.

Some abnormalities of the coconut palm, T. PETCH (*Ann. Roy. Bot. Gard., Peradeniya, 6 (1915), No. 1, pp. 21–30*).—In these notes the author describes a number of abnormalities which are of more or less common occurrence among coconut palms and fruit.

Walnut mutant investigations, E. B. BABCOCK (*Proc. Nat. Acad. Sci., 1 (1915), No. 10, pp. 535–537*).—A discussion of the walnut mutant (*Juglans californica quercina*) previously noted (E. S. R., 32, p. 338) with special reference to the character of mutation.

The author finds in part that the mutation takes place in female flowers only and appears in the first generation after the mutation occurs, but upon crossing the species type it is completely recessive in the F_1 generation. The nature of the mutation is such that only certain genetic factors are affected without having the chromosome number disturbed.

Walnut culture in Arizona, J. J. THORNBER (*Arizona Sta. Bul. 76 (1915), pp. 469–503, pls. 2, figs. 9*).—In this bulletin the author describes the work of C. R. Biederman and R. A. Smith, sr., in grafting French and English walnuts upon Arizona stock. Consideration is given to miscellaneous trials in growing walnuts in Arizona. The Arizona walnut (*Juglans major*) is described with reference to its range, growth, and value as a stock for English and French nuts. Notes are given on growing walnuts in California, together with suggestions for walnut growing in Arizona.

The methods of propagation employed by C. R. Biederman, and here described in detail, consist of bark grafting and splice grafting. As high as 90 per cent of live grafts have been secured and with successful manipulation grafting is accomplished during most of the growing season. The important features of these methods of grafting as employed by Biederman are the exposing of a relatively large cambium surface on the scions so as to insure contact at many points with the cambium surface of the stock, the hollowing out of some of the pith and wood of the scarf or diagonal cut of the scion to prevent this from swelling and pushing the cambium surfaces apart, and also to enable the cambium surfaces of scions and stock to lie closely together. Special tools are employed such as a thin-curved steel bark separator for separating the cambium from the wood of the stock, a small knife-shaped gouge for hollowing out the wood and pith, and a small plane for fitting the surfaces closely together. Extreme care is used in selecting and storing scions, sanitary methods are used throughout, and all cut surfaces are waxed to prevent drying out.

The method of grafting employed by R. A. Smith, sr., consists of cleft grafting below the surface of the ground at the point of the somewhat enlarged root, fine moist dirt being drawn closely against the base of the tree so as to cover up both stock and scion.

The cultivation of medicinal plants, F. B. KILMER (*Amer. Jour. Pharm., 87 (1915), Nos. 8, pp. 343–359; 9, pp. 421–435*).—A review of the present status of the drug plant industry, including a bibliography of literature on drug culture.

Some effects of selection on the production of alkaloids in belladonna, A. F. Sievers (*U. S. Dept. Agr. Bul. 306 (1915), pp. 20, figs. 10*).—In a previous investigation a wide range of variation was found in the alkaloidal content of belladonna plants (E. S. R., 30, p. 44). The present work was undertaken to determine whether the characteristic of alkaloid production is transmissible to the progeny through seed and whether the character is changed by vegetative propagation. Consideration is given to selection of typical plants, method of controlling pollination, first generation plants from cross-pollinated parents, comparison of F_1 plants from cross-pollinated and close-pollinated parents, second generation plants from cross-pollination, and reproduction of selected plants from cuttings.

The results thus far show that F_1 plants from seed of cross-pollinated selected individuals display the characteristic of the maternal parent with regard to alkaloid productivity. This condition is generally true for at least two successive seasons. Close pollination of the parent plant has shown only a moderate influence on the transmission of this characteristic.

Second-generation plants from cross-pollination have been grown at widely separated places, including Arlington, Va., Madison, Wis., and Timmonsville, S. C. At all three stations the plants have shown the relative alkaloid-producing tendencies evident in the original parent plant and the generation preceding. On the other hand, certain conditions of locality appear to affect the general quality of alkaloids produced. For example, two pickings from Madison, Wis., yielded more alkaloids than those at Arlington. Nothing definite developed to indicate that a relationship exists between the amount of precipitation and sunshine and percentage of alkaloids produced. Plants grown from cuttings showed a marked tendency to remain true to type.

The cultivation and distillation of wormwood in Wisconsin, E. Kremers (*Bul. Univ. Wis. No. 738 (1914), pp. 32–45, figs. 9*).—A popular account of the wormwood oil industry in Wisconsin based upon a survey of the industry conducted under the direction of the Pharmaceutical Experiment Station.

Changes of color and structure of flowers by removing sunlight at selected hours, H. E. Rawson (*Jour. Roy. Hort. Soc., 41 (1915), No. 1, pp. 42–46*).—As a result of the experiments here described the author comes to the conclusion that both color changes and structural changes in flowers may be brought about and fixed in succeeding generations by exposure to some particular form of sunlight. Generally speaking it appears that low sun promotes yellows, middle sun reds, and high sun purples, with special reference to latitude and climate in England.

On pressing flowers to retain their colors, C. F. Fothergill (*Jour. Roy. Hort. Soc., 41 (1915), No. 1, pp. 40, 41*).—The important feature of the method of pressing here described consists of the use of layers of cotton batting supported by wire meshes, instead of the usual blotting paper and boards. This permits of a rapid drying out of the flowers before the pigment is decomposed.

The evolution of the cultivated chrysanthemum (*Missouri Bot. Gard. Bul., 3 (1915), No. 10, pp. 123–126, pl. 1*).—A short popular account.

Garden gladioli, A. C. Hottes (*Jour. Heredity, 6 (1915), No. 11, pp. 499–504, figs. 3*).—This comprises a short discussion of plant breeding work in connection with the development of the present forms of cultivated gladioli.

The inheritance of doubleness in Matthiola and Petunia.—I, The hypotheses, H. B. Frost (*Amer. Nat., 49 (1915), No. 586, pp. 623–636, fig. 1*).—A review of the literature of the subject with bibliography appended.

Specific and varietal characters in annual sunflowers, T. D. A. Cockerell (*Amer. Nat., 49 (1915), No. 586, pp. 609–622, fig. 1*).—A critical study of the

annual sunflowers leads the author to conclude in part that there have been few really new developments in the *Helianthus annuus* group. Species which seem very distinct prove on examination to have few special characters of their own. As with the dahlia, the horticulturist may expect to be able to produce many interesting varieties by selecting and saving the various possible combinations, but analysis shows that the genes going into these are the old ones, the effects of which may be seen from time to time, even in wild plants.

Sweet peas, H. J. Wright (*London: T. C. & E. C. Jack, 1914, rev. ed., XI+116 pls. 8*).—In the present edition of this work (E. S. R., 23, p. 642) lists of varieties have been revised and brought up to date.

Our house plants and their culture, H. Schaefer (*Unsere Zimmerpflanzen und ihre Kultur. Ratisbon: J. Habbel, 1914, pp. VII+101, figs. 48*).—A practical guide to the culture, care, and utilization of the more desirable ornamental house plants.

Continuous bloom in America, Louise Shelton (*New York: Charles Scribner's Sons, 1915, pp. XVIII+145, pls. 26*).—A popular treatise on ornamental gardening with special reference to plant material, plant arrangement, and the blooming period of various plants. The work also contains miscellaneous gardening advice, together with a number of planting charts.

The well-considered garden, Louisa Y. King (*New York: Charles Scribner's Sons, 1915, pp. XV+290, pls. 33*).—A popular treatise on ornamental gardening with special reference to plant material, design, and color arrangement. Information is also given relative to garden accessories, gardening expedients, etc., together with a brief sketch of a number of desirable garden books. Some notes on garden clubs are appended.

A reading list on flower gardening, including lawns, trees, and shrubs (*Kansas City, Mo.: Pub. Libr., 1915, pp. 11*).—A bibliography prepared by the Kansas City Public Library.

How to lay out suburban home grounds, H. J. Kellaway (*New York: John Wiley & Sons, 1915, 2. ed., enl., pp. XI+134, pl. 1, figs. 55*).—The present edition of this treatise on the development of small suburban grounds (E. S. R., 19, p. 745) has been somewhat enlarged.

Planting to attract birds (*Baltimore: Munder-Thomsen Press, 1915, pp. 48*).—This comprises a concise list of the berry-bearing trees and shrubs that help provide food for birds, including a brief description of their habits, flowers, and fruits.

FORESTRY.

Cooperation in forestry, B. E. Fernow (*Com. Conserv. Canada Rpt., 6 (1915), pp. 120–126, pl. 1*).—In this paper the author suggests methods of improving the administration of public timber lands in Canada, calls attention to the desirability of expanding the scientific work of the Dominion Forestry Branch as a basis for future forest management, and cites illustrations from other countries to show the desirability of developing forestry as a systematically planned state business.

Essential features of a successful fire protection organization, H. R. MacMillan (*Com. Conserv. Canada Rpt., 6 (1915), pp. 127–135*).—A paper on this subject read before the Canadian Commission of Conservation, and in which the author draws largely from the protective policy of the British Columbia Forestry Branch.

The working plan of the St. Maurice Protective Association, H. Sorgius (*Canad. Forestry Jour., 11 (1915), No. 11, pp. 247–249, figs. 3*).—A short account of forest fire protective work in the St. Maurice Valley, Quebec Province.

Forestry situation in Quebec, G. C. Piché (*Com. Conserv. Canada Rpt., 6 (1915), pp. 195–199*).—A short review of progress made in various lines of forestry by the Forest Service of Quebec since its reorganization in 1909.

Report of the director of forests, N. W. Jolly (*Ann. Rpt. Dir. Forests [Queensland], 1914, pp. 7, pls. 4; Ann. Rpt. Dept. Pub. Lands Queensland, 1914, pp. 49–53, pls. 4*).—A report relative to the administration and management of the state forests in Queensland, including a financial statement for the year 1914. Data relative to state forests, national parks, and timber reserves are included, together with a statistical account of the sawmilling industry from 1909 to 1914.

Quinquennial review of forest administration in British India for the period 1909–10 to 1913–14, to which is appended the annual return of forest statistics for the year 1913–14 (*Quinquen. Rev. Forest Admin. Brit. India, 1909–1914, pp. 2+12+31, pl. 1*).—A statistical review of forest administration in British India with reference to the constitution of the forests, organization, conservation and improvement, forest management, exploitation and commercial development, financial results, and research. The usual statistical review for the year ended June 30, 1914, including a summary of revenues, expenditures, and surplus during the previous 25 years, is appended.

Forest service in Netherlands East India (*Netherlands East Indian-San Francisco Com., Dept. Agr., Indus. and Com., Essay No. 13 (1914), pp. 16, pls. 9*).—This paper gives an account of the development and exploitation of teak and wild timber forests, principally on the islands of Java and Madoera. Consideration is also given to the lumber industry and the forestry experimental station, together with a brief review of forestry in the remaining islands of the East Indian Archipelago.

The first forest reconnoissance in west and north Sumatra, E. K. Plasschaert (*Boschbouwk. Tijdschr. Tectona, 8 (1915), No. 8, pp. 521–538*).—An account is given of a preliminary survey of the forests in west and north Sumatra with special reference to the physiography of the region, the important species comprising the forests, and opportunities for exporting the timber.

Report on the knowledge of the forests of Preanger, H. J. Kerbert (*Boschbouwk. Tijdschr. Tectona, 8 (1915), No. 4, pp. 185–219*).—A descriptive account of the forests of Preanger, Java, including data relative to the important timber species.

Timber in Canada, R. H. Campbell (*Canad. Forestry Jour., 11 (1915), No. 11, pp. 265–268*).—This comprises a statistical estimate and discussion relative to the available saw timber supply in the Canadian Provinces.

The betel-nut palm (Areca catechu) and its cultivation in North Kanara, N. V. Kelkar (*Poona Agr. Col. Reprints No. 2 (1915), pp. 13, fig. 1*).—An account of the betel-nut palm with reference to its nomenclature, habitat, region of culture, soil and moisture requirements, methods of culture, preparation of nuts for market, varieties, economic uses of the tree, and estimates of expenses and income per acre.

Cinchona (*Netherlands East Indian-San Francisco Com., Dept. Agr., Indus. and Com., Essay No. 24 (1914), pp. 9, pls. 4*).—An account of the cinchona industry with special reference to the cultivation and preparation of cinchona in Netherlands East India.

Dhauri (Lagerstrœmia parviflora), E. Benskin (*[Indian] Forest Bul. 28 (1915), pp. 11, pl. 1*).—An account is given of this Indian forest species with reference to its general distribution; locality and habit; description, properties, and uses of the timber; minor products; natural reproduction and rate of growth; artificial reproduction; and notes on distribution and extraction in different Provinces. A sample of the natural wood accompanies the bulletin.

Blackwood (Dalbergia latifolia), E. BENSKIN (*[Indian] Forest Bul. 27 (1915), pp. 12, pl. 1*).—A note similar to the above on Bombay blackwood or rosewood of southern India.

Note on sundri timber (Heritiera minor), R. S. PEARSON (*[Indian] Forest Bul. 29 (1915), pp. 8, pl. 1*).—This comprises a note similar to the above on sundri timber.

Seasonal variations in the storage of plant food in Hevea brasiliensis and their relation to resting periods, L. E. CAMPBELL (*Dept. Agr. Ceylon Bul. 22 (1915), pp. 18, pls. 7*).—In this bulletin results are given of a comparative study of untapped and tapped trees of *H. brasiliensis*, conducted with the view of determining what relation, if any, exists between food storage and the resting period of the tree.

As briefly summarized the experiments show that there is a variation in the amounts of rubber obtained which agrees with the order of variation in the amounts of reserve starch in the bark and wood during the same months. The results indicate that the period during which the rubber trees are rested must include the period which extends from the time the new leaves are developing to about the third week after the leaves have fully developed. This resting period can be profitably extended by ceasing tapping when the leaves are falling and commencing again one month or more after the trees have regained their full foliage.

Preservation of railway ties, H. K. WICKSTEED (*Com. Conserv. Canada Rpt., 6 (1915), pp. 76–86*).—In this paper the author discusses the importance of wood preservation and describes a method of artificially seasoning and waterproofing ties and other timbers developed by G. W. and G. B. McMullen. In the new process the ties are placed in a kiln, here described, and surrounded with warm vapor, which softens and volatilizes the saps and resins in the wood. After some hours of treatment the amount of moisture is slowly reduced until finally the ties are removed with not more than 5 per cent of moisture in them. The ties are then waterproofed in a hot bath of heavy asphalt and sanded to absorb superfluous stickiness.

A brief report on the above process by J. S. Bates is also given.

DISEASES OF PLANTS.

[Notes from the California station on miscellaneous plant diseases] (*California Sta. Rpt. 1915, pp. 22–24, 25*).—Brief accounts are given of investigations which have been carried out on a number of plant diseases.

The cause of bench root in citrus nursery stock has been found to be the inability of the root to penetrate the tough, fibrous seed coat before encircling the cotyledons in an effort to break through the seed coat. Seeds which had the coat removed before planting showed no bench root, and soaking the seed before planting was found to reduce the trouble to about 10 per cent.

Recent investigations by Miss E. H. Smith have shown that the so-called sour sap disease, which has resulted in extensive losses in citrus nursery stock, is due to the fungus which has been described as causing the brown rot of lemons (E. S. R., 19, p. 658).

In the treatment of gum diseases of lemon, and also of scaly bark of orange, Bordeaux paste has given very satisfactory results.

Investigations by the division of plant pathology have shown that the age and productive capacity of many of the deciduous orchards of the State are reduced by fully 50 per cent by wood-decaying fungi. This loss, it is said, can be largely avoided by pruning and by disinfecting large cuts with corrosive sublimate and afterwards keeping the cuts covered with asphaltum.

Marked differences in susceptibility between different varieties of olive to olive knot are reported. The nature of the disease has been quite thoroughly determined, and it has been found that the best method of prevention and control is to cut out knots at the first appearance in the orchard, so as to prevent the disease attacking the whole orchard.

A study of the oak fungus (*Armillaria* sp.) has shown that it is a very destructive plant disease which may be controlled, under some conditions, by trenching, and under other conditions the fungus may be destroyed by means of carbon bisulphid. It is stated that citrus, prune, peach, apricot, and almond trees are attacked by this fungus, while pears, black walnuts, and figs are immune to it.

Some notes are given on the curly top disease of sugar beets, in which the possible relationship to an organism transmitted by insects is pointed out.

Attention is called to fruit stains, spots, and rots caused by the wither-tip fungus (*Colletotrichum glœosporioides*), and it is stated that the oil from lemons and oranges is toxic to the fruit rind when present in very small amounts, if the surrounding atmosphere is moist. Oil spot injury is said to be identical in appearance with the so-called green spot.

Report on economic mycology, E. S. SALMON ET AL. (*Jour. Southeast. Agr. Col. Wye, No. 22 (1913), pp. 387–496, pls. 19, figs. 11*).—A report is given on the special investigations noted below, or previously (E. S. R., 32, pp. 148, 547) from other sources.

Besides a list of diseases most frequently sent in for examination and report, more particular mention is made of the silver leaf fungus (*Stereum purpureum*), a mild outbreak of corky scab (*Spongospora solani*), isolated outbreaks of wart disease (*Chrysophlyctis endobiotica*), crown gall of alfalfa (*Urophlyctis alfalfæ*), and the brown rot fungus (*Sclerotinia fructigena*) attacking frequently and severely cherries, plums, and apples.

The American gooseberry mildew is reported upon as extending its acreage considerably during the last few years. Pruning of diseased bushes is being evaded, in spite of penalties, by many growers on account of the view that the practice is unprofitable and disastrous to the bushes. Spraying experiments against the mildew (E. S. R., 29, p. 249) have been followed up by biological studies, which are reported, and by comparative tests at three centers, lime sulphur and liver of sulphur being used. The former preparation gave decidedly the better results as a fungicide, and it proved also to be remarkably adherent when once dry, even under exposure to heavy rains. Studies in the life history of the fungus show that berries carrying the winter stage may infect the soil under the bushes and spread the disease the following year. Early pruning is regarded as of primary importance and spraying at certain times as a valuable adjunct. Varieties are listed as suited to different strengths of lime sulphur to be employed, and desirable conditions and management recommended are outlined.

Annual report of division of botany, 1913–14, I. B. P. EVANS (*Union So. Africa Dept. Agr. Rpt. 1913–14, pp. 147–158*).—This includes investigations on forage crops, poisonous plants, and noxious weeds, as well as on various plant diseases.

The most important plant diseases noted during the year are said to have been club root of cabbage and cauliflower (*Plasmodiophora brassicæ*), stem rot of cabbage (*Phoma brassicæ*), and a disease of loganberry, (*Hendersonia rubi*).

The reports of van der Byl on the mottling disease of *Acacia mollissima* have already been noted (E. S. R., 33, pp. 151, 523).

A report on coconut palm troubles in Portugese East Africa includes a leaf spot (*Pestalozzia palmarum*), bud rot (*Bacillus coli*), two fungus diseases of

young nuts due, respectively, to *Glœosporium* sp. and *Diplodia palmicola*, nonsetting of fruit ascribed to defective pollination, and chlorosis ascribed to defects in ventilation and drainage.

A carnation wilt is attributed to a Fusarium which is under investigation.

Diplodia pinea is found to attack and kill nursery stock and adult trees in seven species of pines.

Dry rot of maize (*Diplodia maydis*), which causes increasing loss, is retarded by addition of lime to the soil. A root disease of maize is ascribed to a Fusarium.

Puccinia graminis is under investigation as regards means of control.

A study of bacterial disease of mango by Ethel M. Doidge is briefly reported upon. Inoculation experiments have been only partially successful.

A new disease of *Schinus molle* is reported as attacking nursery stock 12 to 18 in. high, causing black spots on the stems, and also on the leaves, which soon dry up, but usually not attacking the woody stems of the second season's growth. It is ascribed to an undescribed species of Colletotrichum, and has been controlled with Bordeaux mixture.

In continuation of investigations by Miss Doidge on potato disease (E. S. R., 33, p. 742), black heart in imported potatoes is found to be due to abnormal temperatures during transit. Fumigation tests with tubers employing formaldehyde gas showed little or no injury.

A short list is given of publications issued during the year.

The probable nonvalidity of the genera Botryodiplodia, Diplodiella, Chætodiplodia, and Lasiodiplodia, J. J. Taubenhaus (*Amer. Jour. Bot., 2* (*1915*), *No. 7, pp. 324–331, pls. 3*).—The author reports a further study of the fungus designated as *L. tubericola*, the cause of Java black rot of sweet potato (E. S. R., 30, p. 150), but suspected to be really a Diplodia.

As a result of this work, the author concludes that the genera Lasiodiplodia, Chætodiplodia, Botryodiplodia, and Diplodiella are not tenable, and that their species should be placed in the genus Diplodia, which is retained because of its priority. It is thought probable that further work will show the necessity of abolishing the genera Rhyncodiplodia and Pellioniella, and that more work will further reduce the large number of species of Diplodia.

A bibliography is given.

The biology of Puccinia arenariæ, F. Wille (*Ber. Deut. Bot. Gesell., 33* (*1915*), *No. 2, pp. 91–95*).—Describing five series of tests made with *P. arenariæ* from various hosts on different plants, the author concludes that while sharp specialization was not established, a degree thereof may have been indicated by the results of some inoculations as noted.

New Chinese fungi, I. Miyake (*Bot. Mag.* [*Tokyo*], *28* (*1914*), *No. 327, pp. 37–56, pl. 1*).—The author reports having collected in northern China in 1912 a number of fungi, of which he has named as new species *Pleospora lespedezæ* on stems of *Lespedeza bicolor*, *Rehmiella ulmicola* on leaves of *Ulmus* sp., *Æcidium callistephi* on leaves of *Callistephus sinensis*, *Coniothyrium tiliæ* on leaves of *Tilia cordata*, *C. spirææ* on leaves of *Spiræa pubescens*, *Septoria perillæ* on leaves of *Perilla ocimoides*, and *Septoglœum anemones* on leaves of *Anemone* sp.

Parasitism of Comandra umbellata, G. G. Hedgcock (*U. S. Dept. Agr., Jour. Agr. Research, 5* (*1915*), *No. 3, pp. 133–135*).—On account of *C. umbellata* serving as a host for the alternate or summer stage of the heterœcious rust, *Peridermium pyriforme*, the author has investigated the root system of this and a related species and has found *C. umbellata* parasitic on 50 species of plants covering a wide range of families, and, in addition, it was found on at least 3 unidentified species of grasses.

Attempts have been made to grow these plants in a greenhouse, and successful results were obtained when they were transplanted without breaking the roots of the parasite attached to those of the host, or when they were germinated in the presence of the roots of the host plants after the seed had been exposed to freezing temperatures.

It is stated that Meinecke found that seeds sown in 1913 remained dormant until 1915, when they germinated and grew without attachment to host plants. This indicates that species of Comandra can live without parasitism if necessary, but it remains to be seen whether these plants will continue to grow indefinitely without the presence of host plants.

The effects of illuminating gas on root systems, E. M. HARVEY and R. C. ROSE (*Bot. Gaz., 60 (1915), No. 1, pp. 27–44, figs. 9*).—This investigation was undertaken to determine some of the effects of illuminating gas on root systems, in order to secure further diagnostic characters of gas poisoning and to ascertain whether the chief causes of gas injury are the soluble constituents or the relatively insoluble ones which are found mainly in the interstices of the soil.

Tests are described in which it is claimed that the odorous constituents of gas, which are slightly or not at all toxic to roots of plants, were readily absorbed and strongly held by the soil. The constituents remaining in the gaseous state thus constituted the chief source of injury to root systems. Ethylene is probably the most harmful of the constituents, except in very high concentrations of illuminating gas, in which case other substances and other factors may become operative.

High concentrations of illuminating gas resulted in rapid killing, with development of no other symptoms. Low concentrations of ethylene gas, or of illuminating gas having like concentrations thereof, caused abnormal development of tissue, from 2.5 to 20 per cent of illuminating gas producing this effect within 8 to 21 days.

Abnormal tissue development in the roots of woody plants often followed slow percolation of gas through the soil. In low concentrations of illuminating gas, hydrolysis of starch and some related chemical reactions were accelerated.

The etiolated sweet pea seedling is said to be a very delicate indicator of illuminating gas in the soil.

A bibliography is appended.

The fungicidal and insecticidal action of hot water and hot copper sprays, L. SEMICHON (*Compt. Rend. Acad. Agr. France, 1 (1915), No. 5, pp. 190–206*).—It is stated that while the tissues of fruit trees and garden plants undergo without injury spraying for a few seconds with water at a temperature of about 65 to 75° C. (149 to 167° F.), some of their common cryptogamic parasites are checked by spraying at 55 to 65° C. (131 to 149° F.), and these temperatures are also fatal to injurious insects.

These temperatures are said to confer increased capacity to spread, penetrate interstices, and adhere in case of copper sprays. The cost of treatment and possible adaptations thereof are also discussed.

Mildew of cereals (Sclerospora macrospora) in France, G. ARNAUD (*Compt. Rend. Acad. Agr. France, 1 (1915), No. 14, pp. 429–435, figs. 2*).—The presence of *S. macrospora* on wheat is noted, supposedly its first appearance in France, though not uncommon in parts of Italy, where other plants, cultivated or wild, are also attacked.

The fungus appears to develop most favorably in moist localities, attacking all aerial portions of the plant, but more commonly the leaf. It may cause deformation, discoloration, and desiccation, the damage done to crops, however, appearing to be comparatively small, except in very humid localities.

Of preventive and remedial measures, drainage and rotation are regarded as practicable, and cultivation of resistant varieties as desirable, if found to be possible.

The action of sulphuric acid on stalk disease of wheat, J. CAPUS (*Compt. Rend. Acad. Agr. France, 1 (1915), No. 6, pp. 224–231*).—The results are given of a study on the development of foot or stalk disease of cereals ascribed to *Leptosphæria herpotrichoides.*

The action of sulphuric acid, regarding which conflicting opinions are held, has been studied. It is thought that the killing of the lower leaves by the use of this acid, as reported by Rabaté (E. S. R., 30, p. 441), may be the actual cause of the checking of the fungus, which is opposed by aeration and sunshine, and also by dryness of the soil, luxuriant growth or abundant soil moisture being very favorable to its development.

Infection experiments with timothy rust, E. C. STAKMAN and LOUISE JENSEN (*U. S. Dept. Agr., Jour. Agr. Research, 5 (1915), No. 5, pp. 211–216*).—As a result of experiments carried on at the Minnesota Station, in which inoculations were made on seedlings, the authors have found that timothy rust (which has been called *Puccinia phleipratensis*) may be successfully transferred directly from timothy to *Avena sativa, A. fatua, A. elatior, Hordeum vulgare, Secale cereale, Dactylis glomerata, Elymus virginicus, Lolium italicum, L. perenne,* and *Bromus tectorum.*

Attempts to increase the infection capabilities of the rust by the use of bridging hosts for short periods of time were unsuccessful. The infection capabilities of timothy rust are said to be quite similar to those of *P. graminis avenæ.* Attempts to infect timothy with *P. graminis avenæ* and *P. graminis hordei* were unsuccessful. The morphology of the spores of timothy rust on different hosts varies slightly, those produced on barley being considerably smaller than those on more congenial hosts.

A heart rot of celery caused by bacteria, H. WORMALD (*Jour. Southeast. Agr. Col. Wye, No. 22 (1913), pp. 457–473, pls. 4, fig. 1*).—A somewhat detailed account has already been noted (E. S. R., 31, p. 542) of the organism there described as *Bacillus apiovorus* n. sp., the cause of a celery rot. It is thought probable, as the result of recent studies described, that several bacteria may be concerned in the production of bacteriosis in celery.

The chief protective measures recommended are the burning of plants affected, rotation, and control of attacks by snails, slugs, nematodes, and biting insects.

A bibliography is appended.

Dissemination of bacterial wilt of cucurbits, F. V. RAND (*U. S. Dept. Agr., Jour. Agr. Research, 5 (1915), No. 6, pp. 257–260, pl. 1*).—A preliminary note is given of investigations conducted to throw some light on the mode of hibernation of the bacteria which cause the wilt of cucurbits and of developing some practical method of control.

Cucumber plants were grown in cages so constructed as to prevent the entrance of injurious insects, and the results obtained indicate that the wilt bacteria are carried over the winter by the hibernating beetles and inoculated into the cucumbers as they feed upon the young leaves. From results obtained in four cages, it appears that not all hibernating beetles can carry the disease, but only those which have previously fed upon wilted plants. Negative evidence is also afforded by the fact that in all the cages from which beetles were excluded the plants remained free from the disease in two fields where it was very prevalent.

Some ginseng troubles, E. A. BESSEY and J. A. MCCLINTOCK (*Michigan Sta. Spec. Bul. 72 (1915), pp. 3–15, figs. 5*).—Notes are given on the black rot of ginseng, due to *Sclerotinia panacis,* the control of damping-off of ginseng seed-

lings by treatment of the soil with formaldehyde, and the ginseng nematode and its relation to golden seal.

The black rot fungus is said to attack the roots during the winter and not to spread at all during the growing season. During the first winter only the outer part of the diseased root is blackened, but during the second winter infected roots turn black throughout and become more or less hollow and shrunken. Sterilization of the soil with a 40 per cent solution of formaldehyde, 1 part to 50 or 1 part to 25, applied at the rate of 1 gal. per square foot, has successfully controlled the black rot fungus. Sterilization with steam, where such was possible, has also given good results.

For the control of the damping-off of seedlings, soil sterilization by application of a solution of formaldehyde is recommended.

A detailed account is given of studies conducted to determine whether golden seal could be used in rotation with ginseng where nematodes were present in the soil, a preliminary account of which has already been given (E. S. R., 31, p. 345). For the control of the nematodes, no chemical treatment has been found entirely satisfactory, and the only practical method seems to be that of steam sterilization, which, it is said, would cost about $10 per 1,000 square feet of soil.

Experiments on the control of the root-knot nematode, J. A. McClintock (*Michigan Sta. Tech. Bul. 20* (*1915*), *pp. 3–23*).—The results of field and laboratory experiments for the control of nematodes are given, the investigation being carried on in connection with a study of ginseng diseases (see above).

In the field plats were enclosed by galvanized sheet iron to a depth of 30 in. and treated with carbon bisulphid, tobacco stems, sulphuric acid, formaldehyde solutions, naphthalin, ammonia, Black Leaf 40, tobacco dust, kerosene, and gasoline. The data obtained from the above experiments indicate that none of the treatments could be depended upon to eradicate the root-knot nematode from the soil. Carbon bisulphid, tobacco stems, and strong formaldehyde solutions reduced the number of nematodes, and these treatments might be practicable in case of rapidly growing crops, but they would not be of any particular importance with a crop like ginseng, which occupies the soil from four to six years.

The laboratory experiments were carried out on egg masses treated with a large number of different chemicals. Taken as a whole, it did not appear that the chemicals could be depended upon to control nematodes as they did not prevent the hatching of the eggs.

Steam sterilization under pressure of 70 lbs. for 30 minutes or 80 lbs. for 15 minutes, it is thought, would destroy all the nematodes present in soil.

Alternaria panax, the cause of a root rot of ginseng, J. Rosenbaum and C. L. Zinnsmeister (*U. S. Dept. Agr., Jour. Agr. Research, 5* (*1915*), *No. 4, pp. 181, 182, pls. 2*).—While engaged in a study of the diseases of ginseng, the authors noted in a garden near Cleveland, Ohio, roots which showed a peculiar dry-rotted condition about the crown. An examination showed the presence of an Alternaria-like fungus, closely resembling that described by Whetzel as the cause of blight, to which the name *A. panax* was given (E. S. R., 27, p. 446).

By means of culture and inoculation experiments the authors have produced the disease in which symptoms and lesions were characteristic when made from both *A. panax* and the species thought to resemble it. As no cultural differences can be recognized, they believe the two fungi are identical and that the organism causing the blight may also cause the root rot.

For control, in addition to spraying, care in transplanting so as to injure the roots as little as possible, the removal of all tops and stems in the fall, and, where the crowns of the roots are sufficiently deep below the surface, burning over the soil after the tops have been removed are recommended.

Some potato tuber rots caused by species of Fusarium, C. W. CARPENTER (*U. S. Dept. Agr., Jour. Agr. Research, 5 (1915), No. 5, pp. 183–210, pls 8*).—The object of this paper is to demonstrate the parasitic nature of certain species of Fusarium, the tuber rots considered being all of the stem-end and wound-parasitic type.

A new stem-end and wound-invading dry rot that is said to be the cause of serious damage in Pennsylvania is attributed to *F. eumartii* n. sp. Another widely prevalent dry rot similar to the above is referred to *F. radicicola.* This latter species and *F. oxysporum* are associated with the so-called jelly end rot, a serious trouble in the tule lands of California. Experimental inoculations show that *F. oxysporum* and *F. hyperoxysporum*, species of the section Elegans, which has been reported as containing purely vascular parasites, are capable of entirely destroying potato tubers. *F. oxysporum* is also said to be the cause of certain types of tuber rot. *F. radicicola* will cause no rot at temperatures of 12° C., and constant storage temperatures below 50° F., it is said, will prevent the action of *F. radicicola, F. eumartii,* and *F. oxysporum.* It is claimed that the following species of Fusarium are added to those known to be the cause of tuber rot through wound infection: *F. radicicola, F. eumartii, F. oxysporum,* and *F. hyperoxysporum.*

A bibliography of cited literature is given.

Germination and infection with the fungus of the late blight of potato (Phytophthora infestans), I. E. MELHUS (*Wisconsin Sta. Research Bul. 37 (1915), pp. 64, figs. 8*).—The author presents the results of a study of external influences on spore germination and a study of the infection of potato foliage with Phytophthora.

The spores were found to germinate either directly by germ tubes or indirectly by the production of zoospores, the type of germination being determined by temperature, moisture, and medium. The spores were killed in from 6 to 24 hours when exposed to dry atmospheric conditions such as exist in an ordinary room, and by frost which is sufficient to kill the host plant. Leaf juices resulting from the softening of diseased tissues were found to have an inhibiting effect on germination, but light did not hinder germination so long as the temperature was not above the optimum. Indirect or zoospore germination was found to take place in dew or rain in the open under field conditions, while direct germination was not observed on foliage in the open.

The toxicity of various salts to *P. infestans*, and also *Plasmopara viticola*, was tested by the glass slide method, and it was found that, when subjected to optimum temperature conditions for indirect germination, 0.0159 per cent of copper was necessary to prevent germination. Slight changes in the amount of calcium oxid in Bordeaux mixture were not found to change its toxicity materially, and Bordeaux mixture made by the so-called Woburn formula was not more toxic than one high in lime. The spores of Plasmopara were found slightly more resistant to the polysulphids than those of Phytophthora.

In connection with studies on infection of potato foilage, it was found that plants chilled for periods of from 12 to 24 hours at 10 to 13° C. showed a greater amount of infection than controls held at higher temperatures. This is believed to be due to the effect on the fungus rather than on the host, as chilling had no tendency to increase susceptibility. Infection becomes visible in two to three days at temperatures between 23 and 27°, and it may take place on foliage only when direct germination occurs, and through either the upper or lower surface of the leaf. The difference in susceptibility of the upper and lower surfaces is attributed to the difference in the relative number of stomata.

A bibliography is appended.

The control of potato diseases, H. T. GUSSOW (*Ann. Rpt. Quebec Soc. Protec. Plants* [etc.], *7* (*1914–15*), *pp. 43–49*, *fig. 1*).—A discussion is given of potato canker, which is said not to be known to exist at present in Canada, and of powdery scab, which has not been observed west of Quebec, for protection from which directions are given, applying to infected tubers or soil, to diseased or insect-infested plants, or stored tubers.

Distribution of the virus of the mosaic disease in capsules, filaments, anthers, and pistils of affected tobacco plants, H. A. ALLARD (*U. S. Dept. Agr., Jour. Agr. Research*, *5* (*1915*), *No. 6*, *pp. 251–256*, *pl. 1*).—Continuing earlier work (E. S. R., 30, p. 450), the results are given of inoculation experiments in which various parts of the floral organs of plants infected with the mosaic disease were used in an attempt to determine whether the disease might be carried by seeds.

Successful inoculations were made where filaments, anthers, and pistils furnished the inoculating material, and it is believed possible that embryonic development never proceeds in those ovules actually invaded and infected by the virus of the disease. In all experimental tests, germinable seeds from plants infected with the disease always produced normal, healthy seedlings.

Fungus and other diseases of the apple and pear, G. P. DARNELL-SMITH and E. MACKINNON (*Dept. Agr. N. S. Wales, Farmers' Bul. 99* (*1915*), *pp. 45*, *figs. 36*).—A summary is given of local disorders of apple and pear.

Canker, here including diseases characterized by extended and persistent lesions of the bark, is produced by *Sphæropsis malorum*, *Glœosporium fructigenum* (*Glomerella cingulata*), *Valsa* sp., and *Phyllosticta* sp., while some canker producing organisms not yet recorded here are *Nectria ditissima*, *Nummularia discreta*, *Phomopsis mali*, and *Bacillus amylovorus*. Bitter rot (*G. fructigenum*, ascigerous stage *G. cingulata*) of apple is controlled with Bordeaux mixture. Black rot (*S. malorum* or *Diplodia* sp.) is discussed in connection with varietal susceptibility of apples. Cytospora, the common pycnidial stage of Valsa, is described. Apple blotch (*Phyllosticta solitaria*), here very similar to *P. prunicola*, is controlled by Bordeaux mixture. Blight (*B. amylovorus*) has been kept out of Australia. Mildew (*Podosphæra tridactyla* or *P. oxyacanthæ*) is controlled with a spray of lime sulphur or of iron sulphid, applied when the buds are unfolding. Crown gall (*Bacterium tumefaciens*) is controlled by rigid rejection of suspected nursery stock. Apple scab (*Venturia inæqualis*, conidial stage *Fusicladium dendriticum*) is in a degree resisted by about one-third of the varieties named, while pear scab (*V. pyrina*) attacks severely several varieties. Bitter pit is dealt with at some length in connection with recent statements by McAlpine (E. S. R., 33, p. 582). Glassiness or water core is also described.

Of noncryptogamic disorders, spray injury, frost band, and chlorosis are briefly discussed.

Collar blight and related forms of fire blight, C. R. ORTON and J. F. ADAMS (*Pennsylvania Sta. Bul. 136* (*1915*), *pp. 3–23*, *figs. 14*).—A description is given of a form of fire blight which principally attacks the trunks of apple trees near the surface of the ground. This trouble seems to be quite common and destructive in Pennsylvania, and is said to be quite distinct from the winter injury and some forms of root rot with which it is often confused.

The cause of collar blight is *Bacillus amylovorus*, the well-known fire blight organism, and different varieties of apple seem to vary in regard to susceptibility to attack.

Among the predisposing factors to collar blight are fertilization, mulching, cultivation, root grafting, and the age of trees. It seems to be more prevalent on trees which have been highly fertilized with nitrogenous manures. Mulching about the trees also is conducive to the appearance of collar blight, and cultiva-

tion, through the possible injury of the bark, is thought to favor the entrance of the organism. The propagation of orchard trees by root grafting is said to favor this form of the trouble, as top-worked or budded trees do not appear to be so commonly attacked.

The authors discuss methods of dissemination, the organism being apparently distributed largely by insects.

For control, cutting out the blight and sterilizing the cut surfaces with corrosive sublimate, after which the cut area is coated with white-lead paint, are recommended.

A brief description is given of blossom blight, fruit blight, twig blight, and canker blight, which are due to the same organism as that causing collar blight and which occur on apple, pear, and quince trees.

A bacterial disease of stone fruits, F. M. Rolfs (*New York Cornell Sta. Mem. 8 (1915), pp. 375–436, figs. 12*).—In this publication, which is also a thesis for the degree of doctor of philosophy in Cornell University, the author describes a bacterial disease of stone fruits due to *Bacterium pruni*.

Cultivated varieties of the apricot, nectarine, peach, and several varieties of plum are affected by this disease, various names being given to it, such as leaf spot and shot hole on the leaves, black spot and crack of the fruit, black spot and black tip of the young twigs, and bacterial canker when the disease occurs as open perennial wounds on branches. The trouble is reported from 20 States, extending from Connecticut to Florida and westward as far as Kansas, Oklahoma, and Texas.

The symptoms of the disease are described at length, after which the morphology and cultural relations of the organism are given. Attention is called to the varying resistance of different varieties to attack, the majority of American varieties suffering but little, while nearly all Japanese varieties of plum are very subject to the disease. Other host plants show similar differences in susceptibility.

Experiments for the prevention of the disease indicate that Bordeaux mixture will control it, but as the foliage of the peach and nectarine is specially sensitive to the action of copper salts, these must be greatly reduced. Self-boiled lime sulphur alone was found to be much less effective than Bordeaux mixture, but after 2 lbs. of arsenate of lead was added to 50 gal. of the lime sulphur it became much more effective.

For the control of this disease the author recommends careful selection of stock, the cutting out of old neglected trees where young trees are being planted, thorough preparation of the soil, and complete fertilization, together with the spraying.

A bibliography is given.

Little leaf (*California Sta. Rpt. 1915, pp. 10, 11*).—A disease designated as little leaf is said to attack different kinds of trees and is particularly serious on peaches in the San Joaquin Valley.

An investigation has been made of the trouble, and the results thus far obtained indicate that it is accompanied by a lack of available nitrogen in the soil. This may be due to a lack of total nitrogen or to a lack of nitrifying power.

Abnormal bacterial conditions have been found in soils in connection with this disease, as well as dieback and mottled leaf, and this has led Lipman to conclude that these physiological diseases are probably associated with weak nitrifying power of the soil (E. S. R., 33, p. 740).

Fall spraying for peach leaf curl, D. Reddick and L. A. Toan (*New York Cornell Sta. Circ. 31 (1915), pp. 65–73, fig. 1*).—An account is given of spraying of peach orchards for the control of leaf curl, lime-sulphur solution being used

as a fall application. The investigations of the authors, as well as reports from growers, have in no case shown that lime-sulphur solution applied late in the fall was not effective for the control of leaf curl, and it is believed that this treatment would be a safe practice for New York orchardists.

Preliminary note on a disease of Carica papaya, W. Nowell (*Agr. News [Barbados], 14 (1915), No. 341, p. 174*).—What appears to be a well marked disease on the stem, leaves, and fruit of papaya in Barbados, is ascribed to a Colletotrichum. A disease which may prove to be of similar causation is reported from Montserrat as particularly prevalent in the neighborhood of Plymouth.

Some observations on red rust of tea plants, A. R. W. Kerkhoven (*Dept. Landb., Nijv. en Handel [Dutch East Indies], Meded. Proefstat. Thee, No. 32 (1914), pp. 35–40*).—Giving the results of observations during several years, the author concludes that *Cephaleuros virescens,* though often found in association with attack by Helopeltis, is itself the direct cause of the losses associated with red rust of the tea plant. This disease, which is now common in parts of Java, is said to attack more severely the younger and weaker plants, especially those of the finer types. The relation of Helopeltis to attack by the alga is discussed, as is also that of severe pruning.

Use of Bordeaux mixture is said to prove inadequate as a means of control, and the same is true of other direct treatments. Emphasis is laid upon improvement of cultural conditions as the best means of protection.

Ascochyta clematidina, the cause of stem rot and leaf spot of clematis, W. O. Gloyer (*New York State Sta. Tech. Bul. 44 (1915), pp. 3–14, pls. 5*).—This is a reprint of an article previously noted (E. S. R., 33, p. 650).

The presence in human beings of bacteria capable of producing plant tumors, U. Friedemann and W. Magnus (*Ber. Deut. Bot. Gesell., 33 (1915), No. 2, pp. 96–107, pl. 1*).—This is partly a report on the continuation of studies by Magnus (E. S. R., 34, p. 56).

Results are given of studies regarding the capability of *Bacterium tumefaciens* to produce abnormal growths in plant tissue. The omnivorous character of this organism and its ready physiological modification are well shown by results of inoculations as described. It is thought that tissue production in plants after inoculation may bear some relation to wound tissue formation.

[Nematodes attacking ornamental plants], F. V. Theobald (*Jour. Southeast. Agr. Col. Wye, No. 22 (1913), pp. 286–291, pls. 2, figs. 2*).—It is stated that the breeding place of the chrysanthemum nematode (*Aphelenchus ritsemabosi*) has been found to be the flower buds. Larvæ hatched in the soil died, but those hatched in the bud lived when transferred to the soil and attacked the roots developed by healthy cuttings. Soil, dead plants, and cuttings may be vehicles for their dissemination.

Badly stunted and deformed larkspur proved to be full of nematodes as to the lower portion of the stem, and these nematodes attacked larkspur planted in soil in which they had been placed. It is thought that the organism, *Tylenchus devastatrix,* was introduced with the manure. The same nematodes also were found in hyacinths, where their presence produced a peculiar stunted appearance. The infection is thought to come by way of the bulbs, which, however, do not show externally the effects of the attack, which is said to have been ascribed previously to a distinct species, *T. hyacinthi.*

ECONOMIC ZOOLOGY—ENTOMOLOGY.

The use of carbon bisulphid against phylloxera and other insect enemies of plants, V. Vermórel and Crolas (*Guide du Vigneron de l'Horticulteur et de l'Agriculteur pour l'Emploi du Sulfure de Carbone contre le Phylloxera et

les Parasites des Plantes. Villefranche (Rhône): Librairie du Progrès Agricole et Viticole, [1915], 17. ed., pp. 132, figs. 74).—This treatise gives general directions, etc., for the use of carbon bisulphid in combating insect enemies of plants.

Cotton-seed oil soap as a substitute for whale-oil soap, W. W. YOTHERS (*Jour. Econ. Ent., 8 (1915), No. 2, pp. 298, 299*).—The author's experiments show that cotton-seed oil soap, which does not possess the disagreeable odor of fish oil soap, can be used as a substitute for it.

Arsenate of lime or calcium arsenate, W. M. SCOTT (*Jour. Econ. Ent., 8 (1915), No. 2, pp. 194–199*).—A somewhat more detailed account than that previously noted (E. S. R., 33, pp. 339, 340).

The prevention of rabbit injury to young apple trees, E. N. CORY (*Jour. Econ. Ent., 8 (1915), No. 2, pp. 270, 271*).—Lime-sulphur is said to have given satisfactory results and to be the most economical wash that can be used in the protection of large orchards against cotton-tail rabbits.

Seventh annual report of the Quebec Society for the Protection of Plants from Insects and Fungus Diseases, 1914–15 (*Ann. Rpt. Quebec Soc. Protec. Plants [etc.], 7 (1914–15), pp. 143, figs. 31*).—Among the more important entomological papers presented in this, the usual annual report (E. S. R., 32, p. 151), are the following: Some Successes and Failures in Controlling Insects in 1914, by C. R. Crosby (pp. 23–33); The Brown-tail Moth in New Brunswick, by E. H. Strickland (pp. 59–64); Forest Insect Conditions in Stanley Park, Vancouver, B. C., by R. N. Chrystal (pp. 72–75); Some Insect Parasites of the Bud Moth (pp. 76, 77) and Two Bacterial Diseases of Injurious Insect Larvæ (pp. 81–85), by E. M. DuPorte; Shade Tree Insects in Quebec, by J. M. Swaine (pp. 91–115); and Principal Injurious Insects of the Season, 1914 (pp. 121–125), Insects Affecting Shade Trees, Greenhouse Plants, Domestic Animals, and the Household (pp. 126–134), and Useful Keys to Some Economic Families of Insects (pp. 135–142), by W. Lochhead.

Four parasites, namely, *Pimpla (Itoplectes) conquisitor, (Microdus) Bassus earinoides, Opius (Biosteres)* sp., and *Pentarthron minutum (Trichogramma pretiosa)* have been reared by DuPorte from the bud moth, of which all but *M. earinoides* are recorded from this host for the first time. DuPorte also briefly reports upon work with a disease of the tent caterpillar due to a spore-bearing bacillus, and with the disease of the white grub caused by *Micrococcus nigrofaciens.*

[Insect pests in Bihar and Orissa], E. J. WOODHOUSE (*Ann. Rpt. Agr. Stas. Bihar and Orissa, 1913–14, pp. 10–14*).—Brief accounts are given of the insects dealt with during the year under report, including the black cutworm, potato tuber worm, rice worm (*Nymphula depunctalis*), etc.

The Hessian fly and the western wheat-stem sawfly in Manitoba, Saskatchewan, and Alberta, N. CRIDDLE (*Canada Dept. Agr., Ent. Branch Bul. 11 (1915), pp. 23, figs. 4*).—The first part of this bulletin (pp. 7–15) deals with the life history and bionomics of and control measures for the Hessian fly as studied by the author in the Canadian Northwest, where it has been the source of considerable injury. It is thought to have reached Manitoba during the middle eighties, although no definite records of its appearance in that Province are available prior to 1899, in which year the attack covered practically the whole area under wheat crop, causing a loss of from 10 to 30 per cent.

The second part of this bulletin (pp. 16–23) deals with the western wheat-stem sawfly (*Cephus occidentalis*), first recorded in Canada in 1895, an account of which pest by Webster and Reeves has been previously noted (E. S. R., 23, p. 56).

Further studies of the enemies of clover, G. DEL GUERCIO (*Redia, 10 (1915), No. 1–2, pp. 235–301, figs. 42*).—This paper includes information additional to that previously noted (E. S. R., 31, p. 848).

Important insect pests collected on imported nursery stock in 1914, E. R. SASSCER (*Jour. Econ. Ent., 8 (1915), No. 2, pp. 268–270*).—A brief account is given of the more important insect pests detected on nursery stock at ports of entry.

Orchard insect pests and methods of control, H. F. WILSON (*Portland, Oreg.: Pacific Horticultural Correspondence School, 1915, pp. 126, pls. 4, figs. 47*).—A popular treatise prepared for use in correspondence school work.

On some insects injurious to forestry in the Baltic governments, V. N. KODZIANKO (*Abs. in Rev. Appl. Ent., 3 (1915), Ser. A, No. 5, p. 217*).—A report of work carried on at the entomological laboratory established in February, 1914, as a branch of the Baltic station.

The minor horrors of war, A. E. SHIPLEY (*London: Smith, Elder & Co., 1915, 2. ed., pp. XIX+178, figs. 64*).—This work deals with the various ectoparasites, flies, etc., which may transmit disease to man, and with the Mediterranean flour moth in soldiers' biscuits.

Observations on the life history of Bupalus piniarius, V. PLATNIKOFF (*Lesnoi Jour., 44 (1914), No. 5, pp. 801–810; abs. in Internat. Inst. Agr. [Rome] Mo. Bul. Agr. Intel. and Plant Diseases, 6 (1915), No. 2, pp. 314, 315*).—In addition to pine the lepidopteran here considered attacks spruce, juniper, and more rarely spruce cones.

Notes on the biology of Orgyia dubia, N. SACHAROV (*Rev. Russe Ent., 14 (1914), No. 4, pp. 7, figs. 2; abs. in Rev. Appl. Ent., 3 (1915), Ser. A, No. 5, p. 219*).—This lepidopteran is common in the Government of Astrakhan and in other parts of southeastern Russia. The caterpillars breed on wild plants, largely on wormwood and also on *Alhagi camelorum*, and at times may cause considerable injury to fodder grasses.

Preliminary note on the life history of the codling moth in Illinois, S. A. FORBES (*Urbana, Ill.: Off. State Ent., 1915, pp. 15, figs. 6*).—Extraordinary losses of apples in southern Illinois in 1914 from injury by the codling moth, notwithstanding skilled and persistent spraying, led to a general inquiry as to exact details of its life history in Illinos. Observations and experiments are under way, but in the meantime this preliminary circular is issued as a help to an understanding of the problem.

Cutworms and their control, A. GIBSON (*Canada Dept. Agr., Ent. Branch Bul. 10 (1915), pp. 31, figs. 20*).—This is a revised and enlarged edition of that part of Bulletin 3 (E. S. R., 27, p. 659) dealing with cutworms.

Rearing of moths and Tachina flies from larvæ and pupæ of army worm in North Carolina in 1914, F. SHERMAN, JR. (*Jour. Econ. Ent., 8 (1915), No. 2, pp. 299–302*).—Rearings and observations here reported indicate that *Winthemia quadripustulata*, an account of which by Metcalf has been previously noted (E. S. R., 20, p. 1051), is the chief insect parasite of the army worm in the central part of North Carolina and that *Phorocera claripennis* was also an appreciable factor in 1914. *Architas analis* and *Goniomyia unifasciata* both killed many pupæ in western North Carolina in 1914.

A new pest, the chrysanthemum midge (Rhopalomyia hypogæa), E. P. FELT (*Jour. Econ. Ent., 8 (1915), No. 2, p. 267*).—This midge is said to have caused serious injury in the houses of a commercial chrysanthemum grower in Michigan.

The economic relations of the Sarcophagidæ, J. M. ALDRICH (*Jour. Econ. Ent., 8 (1915), No. 2, pp. 242–247*).—Records of the rearing of Sarcophagidæ as

parasites of insects are brought together, and additional data by R. R. Parker follows (pp. 246, 247).

Notes on the onion maggot in 1914, A. I. BOURNE (*Jour. Econ. Ent., 8 (1915), No. 2, pp. 276–279*).—A report of work carried on in continuation of that previously noted (E. S. R., 31, p. 350).

How contact insecticides kill, G. D. SHAFER (*Michigan Sta. Tech. Bul. 21 (1915), pp. 67, pl. 1, figs. 3*).—In this second report, which forms part 3 of the studies previously noted (E. S. R., 26, p. 753), the author considers certain properties of carbon bisulphid, gasoline, and a few other fluids, as well as temperature and some dry powdered contact insecticides by means of which the insecticidal action of these agents is accomplished after their absorption into the insect tissues or after mere application.

The general conclusions drawn are as follows:

"Reductases, catalases, and oxidases were found in water extracts and in the insoluble pulp of the tissues of *Passalus cornutus* and other insects. Moreover, almost certain evidence indicated that the same three kinds of enzym-like bodies exist in the intact tissues of living insects. Heat of certain intensities, and the several contact insecticides studied (gasoline, carbon disulphid, hydrocyanic acid gas, sodium fluorid, etc.), when used at a concentration sufficient to kill insects, deleteriously affected the activities of reductases, catalases, and oxidases—usually in unequal degree, thus disturbing the natural or normal balance of such activities. If the catalase, oxidase, and reductase activities are actually of as vital importance to the life processes of the tissue cells as certain evidence indicated, then the deleterious action of the contact insecticides studied in this connection must be an important factor—perhaps, in some cases, the determining factor—in causing the death of treated insects.

"A study of the influence of the various contact insecticides upon the life processes in nervous tissue cells seems of next importance in this connection. Fat or fat-like membranes (e. g., lard and lanolin) absorbed gasoline vapor (and chloroform vapor) from air charged with that vapor, and the absorbed vapor rendered the membranes less permeable to oxygen. This finding may, in part, account for the fact that less oxygen was used by an insect deeply under the influence of gasoline, since a similar condition existed—in that, under such circumstances, the lipoids of the living, oxygen-absorbing cells, and of the body fluids surrounding them, were impregnated with gasoline. So also, the same finding may help to explain the fact that, in the presence of air containing gasoline vapor, less hydroquinon was oxidized in an 'insect tissue extract plus hydroquinon solution' (in which the reductase had mostly passed) than was the case when the same extract was in pure air.

"Waxen membranes which had been thoroughly wet with lime-sulphur solution were found to be less permeable to oxygen than before they were treated with the solution. Thus lime-sulphur, in addition to its effect as described in a former paper, would render the waxen covering of a scale insect less permeable to oxygen.

"Pupæ of the luna moth and adults of *P. cornutus* in a dormant condition from cold absorbed much less gasoline vapor or vapor of ether in air than did the same insects when they were most active, at a warm room temperature, in air charged with practically the same percentage of vapor. This lowered absorption capacity which was found to accompany the dormant condition may furnish the chief explanation of the fact that insects dormant from cold are harder to kill by ordinary fumigants and by those contact sprays which depend partly upon volatile insecticide ingredients for their effectiveness.

"It was found that certain nonvolatile, powdered solids were able to act as effective contact insecticides when used on certain insects. Such dry, powdered

insecticides stuck fast in exudations on portions of the insect body, where they became partly dissolved, after which they appeared to be slowly absorbed through the body integument.

"Both powdered borax and sodium fluorid may kill cockroaches in the manner of purely contact agents, but normally they become stomach poisons as well—since the roaches regularly lick and swallow some of the powder in cleaning it from their bodies.

"In the case of powdered solid contact insecticides, the advantage seemed to lie in having the powder so fine and dry that it could sift readily into all crevices and could adhere well. Similarly, other things being equal, a weak surface tension gave a liquid contact insecticide an advantage, enabling it to thoroughly wet the bodies of insects and to flow into all irregularities of the area treated.

"Among several substances which were found to increase the 'spread' of lime-sulphur solution, saponin or extracts taken directly from the stems and leaves of *Saponaria officinalis* (bouncing bet) seemed to be best. It is suggested that perhaps the use of extracts from 'bouncing-bet hay' with lime-sulphur solution might prove profitable in orchard spray practice.

"Experiments with ammonia (derived from dry liquefied ammonia) as a fumigant for mill insects were rather disappointing, but the liquefied ammonia was easy to apply and might prove to be a desirable fumigant for insects in some instances.

"When carbon tetrachlorid was compared with carbon disulphid as to its action on grain insects in tight flasks, six times as much of the former was required for effective fumigation. The carbon tetrachlorid was vaporized with heat and satisfactorily used at the rate of 3.55 lbs. for 100 cu. ft. of air space, to insure furs against moths—fumigation being repeated every five weeks during the summer months. The charge as used killed adults of *Tinea biselliella*.

"Evidence indicates that heat might be applied to advantage as an insecticide in many situations where it has never been the practice to use it."

Winter cover washes, A. H. Lees (*Ann. Appl. Biol., 1 (1915), No. 3–4, pp. 351–364*).—The experiments here reported were conducted with a view to obtaining more definite information on psylla control, experience having shown that a lime wash applied as late as possible before the buds burst in the spring will cause a very decided decrease in their attack.

The results indicate that "a thick covering largely prevented the appearance of larvæ in the buds. The lime coatings largely prevented rupture of the egg-shell, and where rupture had taken place many had not succeeded in getting out of the shell. Of those that had, many did not succeed in getting to the surface. Of those that had succeeded in getting to the surface, a good proportion were killed by the powdery lime adhering to their bodies. The whiting coat almost entirely prevented hatching, but did not have such a desiccating action. Under laboratory conditions a thin wash as lime and water 1:10 produced as good a result as a thick wash, but under outside conditions a thick coat is necessary in order to allow for the eroding power of weather conditions." Thus it appears that the beneficial action of lime wash on psylla eggs is due to the mechanical, sealing action rather than to any chemical effect.

Correction of the misuse of the generic name Musca, with description of two new genera, C. H. T. Townsend (*Jour. Wash. Acad. Sci., 5 (1915), No. 12, pp. 433–436*).—The genera Promusca of which *Musca domestica* is the genotype and Viviparomusca of which *M. bezzi* is the genotype are erected. It is pointed out that *M. vomitoria* was designated by Latreille in 1810 as the type of the genus Musca.

Further reports on flies as carriers of infection (*Rpts. Local Govt. Bd. [Gt. Brit.], Pub. Health and Med. Subjs., n. ser., No. 102 (1914), pp. 32; abs. in Rev. Appl. Ent., 3 (1915), Ser. B., No. 6, pp. 88–90*).—Three articles are presented in the seventh of these reports (E. S. R., 30, p. 756).

Do house flies hibernate? by S. M. Copeman and E. E. Austen.—Fifty-eight consignments of flies were received from all parts of England in response to a request for specimens of flies, sent out in order to obtain definite information regarding hibernation. These were represented by 94 specimens, as follows: *Pollenia rudis*, 27; *Muscina stabulans*, 14; *Musca domestica*, 12; *Pyrellia eriophthalma*, 12; *Musca corvina*, 9; *Limnophora septemnotata*, 6; *Calliphora erythrocephala*, 3; *Fannia canicularis*, 3; *Phaonia signata*, 2; *Dasyphora pratorum*, 1; *Phorbia muscaria*, 1; *Muscina pabulorum*, 1; *Chloropisca notata*, 1; *Blepharoptera serrata*, 1; and *Tephrochlamis canescens*, 1.

Notes presented as to conditions under which they were found are said to afford no support to the belief that in England house flies hibernate in the adult stage. The few specimens of the house fly were all taken in an active condition. Some of the other flies, however, such as the extremely common *P. rudis*, were often found partially dormant.

The destruction of flies by means of bacterial cultures, by J. M. Bernstein.—Experiments were conducted by the author along the line followed by Hesse, who was led in 1912 to the conclusion that *Mucor racemosus* is polymorphic and that *Empusa muscæ* is merely a parasitic form of it.

"There can be no doubt that the original statement made by Hesse concerning the possibility of experimentally bringing about the deaths of flies by *E. muscæ* has been verified, but there is much to be done on the subject yet, in order that points still obscure may be satisfactorily cleared up. In the first place the development of the spores of Empusa in moist chambers has not been satisfactorily followed out, nor has the development of *M. racemosus* from the Empusa spore been proved."

An investigation of Mr. Hesse's work on the supposed relationship of Empusa muscæ and Mucor racemosus, by J. Ramsbottom.—The author gives an account of the cultivation of spores of *E. muscæ*. It is stated that so far as preliminary observations go a single Empusa spore on germination has never given rise to the mycelium and eventually the fruit of *M. racemosus*, and where such have occurred in a culture the mycelium could usually be traced to a cluster of spores which might easily have had the smaller spores of Mucor in their midst.

The olfactory sense of Coleoptera, N. E. McIndoo (*Biol. Bul., Mar. Biol. Lab. Woods Hole, 28 (1915), No. 6, pp. 407–460, pls. 2, figs. 3*).

One new genus and two new species of Cerambycidæ, W. S. Fisher (*Proc. Ent. Soc. Wash., 17 (1915), No. 2, pp. 77–79*).—The genus Paratimia and the species *P. conicola* and *Hylotrupes juniperi*, the former reared from old cones of *Pinus attenuata* in California and the latter from dying juniper (*Juniperus pachyphloca*) in Arizona, are described.

A unique type of insect injury, W. R. McConnell (*Jour. Econ. Ent., 8 (1915), No. 2, pp. 261–267*).—An account is given of the bean leaf beetle (*Cerotoma trifurcata*), the larva of which has been found to feed upon and injure the nodules on the roots of the cowpea in the lower Mississippi Valley.

The apple flea weevil in Illinois (Orchestes canus), P. A. Glenn (*Jour. Econ. Ent., 8 (1915), No. 2, pp. 279–286*).—Substantially noted from another source (E. S. R., 31, p. 456).

The Malayan locust (Pachytylus sp.), H. C. Pratt (*Dept. Agr. Fed. Malay States Bul. 24 (1915), pp. 42, pls. 13, figs. 4*).—A description is given of the life history of *Pachytylus* sp., with an account of its distribution and practical methods for controlling its increase. Notes on the distribution and destruction

of locusts in the Federated Malay States in 1913 and 1914 and field methods by F. de la Mare Norris are also included (pp. 28–42).

Rhabdoblatta brunneonigra, a new cockroach from China, A. N. CAUDELL (*Proc. Ent. Soc. Wash., 17 (1915), No. 2, pp. 94, 95, fig. 1*).

A new Hoplandrothrips (Thysanoptera) from British Guiana, J. D. HOOD (*Canad. Ent., 47 (1915), No. 8, pp. 241–244, fig. 1*).—*Hoplandrothrips affinis*, n. sp., the only representative of the genus from South America, was collected from between leaf sheaths of sugar cane, at Rose Hall, Berbice, British Guiana.

Life history of Thelia bimaculata (Membracidæ), W. D. FUNKHOUSER (*Ann. Ent. Soc. Amer., 8 (1915), No. 2, pp. 140–152, figs. 10*).—This article relates to one of the most common and widely distributed species of Membracidæ in the eastern United States. It is said to be abundant on locust (*Robinia pseudacacia*) in the vicinity of Ithaca, N. Y., where the studies were conducted.

Some new species of Jassoidea, S. E. CRUMB (*Ann. Ent. Soc. Amer., 8 (1915), No. 2, pp. 189–198, pl. 1*).—Six species of Deltocephalus, three of Chlorotettix, and one each of Athysanus, Phlepsius, and Eutettix are described as new.

Observations on the oviposition of certain capsids, H. H. KNIGHT (*Jour. Econ. Ent., 8 (1915), No. 2, pp. 293–298, pls. 2, fig. 1*).—Observations made during 1914 of the oviposition of the apple red bug (*Heterocordylus malinus*), false apple red bug (*Lygidea mendax*), false tarnished plant bug (*Lygus invitus*), and *Paracalocoris colon* are reported upon.

The use of water under pressure for the control of mealy bug, W. W. YOTHERS (*Jour. Econ. Ent., 8 (1915), No. 2, pp. 304, 305*).—Reference is made to a 200-acre citrus grove in Florida where the mealy bug is controlled through the application of water under a pressure of 60 lbs. Three sprays are said to be sufficient to control quite a severe infestation.

The citricola scale (Coccus citricola), H. J. QUAYLE (*Jour. Econ. Ent., 8 (1915), No. 2, pp. 291, 292*).—A description of this scale by Campbell has been noted (E. S. R., 32, p. 57).

An outbreak of the alfalfa looper (Autographa gamma californica), J. R. PARKER (*Jour. Econ. Ent., 8 (1915), No. 2, pp. 286–291*).—The alfalfa looper, previously unknown in Montana as a pest of any importance, attracted attention during 1914 in all parts of the State, but was particularly injurious in the central and south central counties.

Carnivorous habits of Xylina bethunei, G. E. SANDERS (*Canad. Ent., 47 (1915), No. 6, pp. 183, 184*).—The fifth and sixth stage larvæ of *X. bethunei*, the most common fruit worm or apple worm in Nova Scotia, have been found to eat into the cocoons of the forest tent-caterpillar and devour the pupæ. Forty-five of 160 cocoons collected at Bridgetown, Nova Scotia, July 8 to 10, from apple trees were found to have been destroyed by these larvæ.

FOODS—HUMAN NUTRITION.

The alimentation of man, P. FRANZ (*Rev. Inst. Agr. Catalán San Isidro, 63 (1914), Nos. 9, pp. 129–132; 11, pp. 168–172; 14, pp. 228–231; 15, pp. 246–248; 16, 257–259; 17, 273–275; 19, 309–313*).—A summary and digest of data which consider the fundamental principles of nutrition and give information regarding the chemical composition and cost of the more important foods making up the diet in Spain.

Report of the fruit and vegetable utilization experiment station of the royal horticultural institute at Dahlem for 1913 (*Landw. Jahrb., 46 (1914), Ergänzungsb., pp. 78–90, figs. 2*).—The experiment station reports as a part of its work (for the year 1913) the following studies of fruits and vegetables: The estimation of solanin in tomatoes; the chemical composition of rhubarb, the fruit

of the Japanese quince, dried bananas, pulp from cider presses, and raspberry juice; an investigation of a vegetable food product prepared by combining cereals, legumes, and fresh vegetables; a study of the material lost in the blanching of mushrooms; and tests of the comparative value of pears preserved in different ways.

The chemistry of flesh foods.—II–IV, The composition and nutritive value of the retail cuts of mutton and lamb, A. M. WRIGHT (*Trans. and Proc. New Zeal. Inst., 47 (1914), pp. 569–572*).—The investigations here reported are a continuation of previous work (E. S. R., 28, pp. 365, 366). Ten each of average quality sheep and lambs were weighed alive, immediately slaughtered, and weights and percentages of the carcasses and of each of the by-products determined. A carcass of mutton and a carcass of lamb were cut into the joints usually offered for sale in the retail trade and the weights and percentages of fat, lean meat, and bone in each of the cuts recorded. Data are given regarding the relative costs of the different retail cuts and the composition of the boneless meat.

The density of wheat as an index of its milling value, LINDET, FLEURENT, and ARPIN (*Compt. Rend. Acad. Agr. France, 1 (1915), No. 21, pp. 632–638*).—Analytical data are given from which the authors conclude that the weight of a unit volume of grain is of practically no use as a standard for the evaluation of wheat. A number of factors which affect this value are considered somewhat at length.

The nutritive value of hay, straw, and other plant parts, H. FRIEDENTHAL (*Die Nährwerterschliessung in Heu und Stroh und Pflanzenteilen aller Art. Leipsic: Reichenbach'sche Verlagsbuchhandlung, 1915, pp. 47, figs. 7*).—A summary and digest of data which considers especially the method of preparing such materials for food purposes. Analyses of several kinds of straw are given, and the composition of these substances compared with that of some common food materials.

Army biscuit recipes, MISS L. M. BADCOCK (*Jour. Roy. Army Med. Corps, 23 (1914), No. 4, pp. 448–450*).—Recipes are given for the preparation of several dishes of which army biscuits form a basis.

Banana meal from Jamaica (*Bul. Imp. Inst. [So. Kensington], 13 (1915), No. 2, pp. 200, 201*).—Comparative analyses are reported of banana flour, wheat flour, and maize meal. The banana flour contained less protein and fat but more ash than either wheat or maize flour.

Viability of Bacillus typhosus in ice cream, O. W. H. MITCHELL (*Jour. Amer. Med. Assoc., 65 (1915), No. 21, pp. 1795–1797*).—In discussing the reasons for undertaking this investigation, the author refers to several epidemics of typhoid fever in which the evidence pointed strongly toward ice cream as the cause, although conclusive proof was not secured. In the experiments reported six mixtures of ice cream were prepared according to common household recipes, and typhoid bacilli added in quantities varying from 40,000 to 320,000 bacilli for each cubic centimeter of the mixture. After freezing, samples of 100 cc. of the inoculated ice creams were packed in ice and salt and stored at temperatures varying from −3 to −4° C. The lengths of time after which *Bacillus typhosus* was isolated from the various samples varied from 12 to 39 days.

[Food inspection, pure food, and other topics], E. F. LADD and ALMA K. JOHNSON (*North Dakota Sta. Spec. Bul., 3 (1915), No. 21, pp. 355–368*).—The results of the inspection of a number of samples of food and beverages are given, together with information regarding some patent medicines. Among the pure food topics considered are warnings against the use of second-hand kegs for soft drinks and the use of saccharin in foods.

A penny lunch, Sarah W. Maury and Lena L. Tachau (*Louisville, Ky.: 1915, pp. 64, pls. 2*).—This book gives information regarding the lunch served at the normal school in Louisville, Ky., especially as to the equipment and the foods served. Recipes are also included.

Your household budget in graphic form, Emma A. Winslow (*[New York: Author], 1914, pp. 6, fig. 1*).—This consists of blank charts in which the income and expenses for food, clothing, etc., may be shown graphically.

Mary at the farm and book of recipes compiled during her visit among the "Pennsylvania Germans," Edith M. Thomas (*Norristown, Pa.: John Hartenstine, 1915, pp. 440, pls. 20, figs. 30*).—This book is in reality a study of housekeeping conditions among the inhabitants of German descent in southeastern Pennsylvania. It contains information rarely seen in print regarding many old handicrafts, as well as many recipes tested by long use among practical housekeepers of the region. It also gives much advice regarding the general principles of housekeeping.

Aluminum alloys and their use for canteens and cooking utensils, J. Boes and H. Weyland (*Ztschr. Untersuch. Nahr. u. Genussmtl., 30 (1915), No. 8, pp. 300–305*).—Chemical analyses are reported of five aluminum alloys which contained appreciable quantities of copper, iron, nickel, magnesia, and silicon. Experiments were carried out to determine the durability of these alloys under such conditions as are common in the everyday use of cooking utensils. The results of the tests indicated that owing to the increased tendency of the aluminum in an alloy to go into solution in the presence of electrolytes, weak bases, or organic acids these alloys are entirely unsuitable for cooking purposes.

Rôle of the pancreas in the digestion and absorption of fat.—I, Digestion, E. F. Terroine (*Jour. Pyhsiol. et Path. Gén., 15 (1913), No. 6, pp. 1125–1133*).—Studies are reported of the relationship between the chemical composition, physical properties, and digestibility of fats. Experiments in vitro showed that in general the digestibility was more complete in the case of those fats containing a large percentage of triolein, while the physical properties of the fats appeared to the author to be of secondary importance. Of the vegetable fats studied, walnut oil, and of the animal fats, human fat, were the most labile toward pancreatic lipase.

Rôle of the pancreas in the digestion and absorption of fat.—II, Absorption, E. F. Terroine and J. Weill (*Jour. Physiol. et Path. Gén., 15 (1913), No. 6, pp. 1148–1158*).—Feeding experiments with laboratory animals are reported, the rate of fat absorption in the case of goose fat, coconut oil, pork fat, mutton fat, and cacao butter being determined by analysis of the blood at a given time after the ingestion of fat.

Goose fat and coconut oil were the most rapidly absorbed. In general the rate of absorption corresponded to the rate of digestion in vitro. Saponification seemed necessary to absorption, for the fatty acids readily soluble in bile appeared more quickly in the blood stream.

The ferments of the pancreas.—V, The carbohydrate ferments of pancreatic juice, J. Mellanby and V. J. Woolley (*Jour. Physiol., 49 (1915), No. 4, pp. 246–264*).—From a consideration of the results of experiments in vitro to determine the nature and properties of pancreatic juice, the authors advance the following hypothesis:

"Pancreatic juice contains one carbohydrate ferment only (amylopsin). In a neutral medium, or in the presence of neutral salts, this ferment breaks down starch to dextrin and maltose only. When acid is added to pancreatic juice, the ferment associates itself with some of the acid, and the activity of the ferment is determined by the hydrogen-ion concentration of this ferment complex."

In addition, they conclude that "the activity of pancreatic juice to which hydrochloric acid has been added suggests that this secretion is capable of hydrolyzing the starch of a dietary to dextrose. Pancreatic juice alone or in the presence of neutral salts, acids, or alkalis, has no action on lactose or cane sugar."

Earlier work has been noted (E. S. R., 32, p. 859).

Lipo-cholesterin variations during inanition and feeding experiments, E. F. TERROINE (*Jour. Physiol. et Path. Gén., 16 (1914), No. 3, pp. 386–397*).—Examinations of the blood of laboratory animals during periods of starvation and food ingestion indicated that its composition varied considerably as regards water, fatty acids, and cholesterin. The cholesterin content diminished regularly during the early periods of inanition. When a fat-rich diet was eaten, an increased amount of both fatty acid and cholesterin appeared in the blood, regardless of the cholesterin content of the food. The ratio of cholesterin to fatty acid remained remarkably constant.

The value of extractives in nutrition, H. ARON (*Monatsschr. Kinderheilk., Orig., 13 (1915), No. 8, pp. 358–380*).—Feeding experiments with laboratory animals (rats) are described, and the course of growth illustrated by charts.

With the addition of an extract of wheat bran to a basal ration of starch, fat, casein, and salts, the animals thrived and increased in weight. Extract of malt gave similar results, but its action was slower. When the basal ration alone was consumed, the animals lost weight and finally died.

Nutrient enemas, V. SCHEEL and E. BEGTRUP (*Ugeskr. Läger, 77 (1915), No. 14, pp. 543–557; abs. in Jour. Amer. Med. Assoc., 64 (1915), No. 21, p. 1804*).—The clinical experience of the authors showed the good absorption and utilization of suitable nutrient enemas. Milk and eggs were not properly absorbed, but amino acids prepared by the digestion of meat or milk by trypsin-erepsin were used to supply from 400 to 600 calories daily with good results.

Albumin milk in infant feeding, V. POULSEN (*Ugeskr. Läger, 77 (1915), No. 22, pp. 875–892*).—Clinical observations upon 85 infants under one year of age and 29 children from one to five years old are reported. No advantages were noted from feeding albumin milk in cases of acute gastro-enteritis, but in chronic dyspepsia good results were obtained in nearly every case.

Homogenized olive oil and fat-free milk mixtures in case of difficult feeding, M. LADD (*Arch. Ped., 32 (1915), No. 6, pp. 409–425*).—The author reports a number of clinical observations and describes a method of administering homogenized olive oil as a substitute for cream in case of fat intolerance in infants.

Some studies on sugar in infant feeding, L. PORTER and C. H. DUNN (*Amer. Jour. Diseases Children, 10 (1915), No. 2, pp. 77–86*).—Clinical observations upon 18 infants supplemented by analytical data are reported, from which the authors conclude that the dangers of sugar injuries and sugar intoxication have been exaggerated, and that in cases of mild fat intolerance it may be desirable oftentimes to meet the energy requirements by using large quantities of soluble carbohydrate.

Some observations further incriminating sugar cane products as the main cause of pellagra in the south, R. BLOSSER (*South. Med. Jour., 8 (1915), No. 1, pp. 33–36*).—Observations are reported of 133 pellagrins, all but 3 of whom had eaten large amounts of cane sugar and sirups. The author states that the exclusion of sugar and other cane products from the diet resulted in a cure for 121 cases, while 8 improved markedly and only 4 died.

Experimental pellagra in the human subject brought about by a restricted diet, J. GOLDBERGER and G. A. WHEELER (*Pub. Health Rpts. [U. S.], 30 (1915), No. 46, pp. 3336–3339*).—A brief outline is given of experiments planned to study

the possibility of producing pellagra in the healthy human individual by a restricted, mainly carbohydrate (cereal), diet.

The subjects were 12 white convicts who had accepted the offer of a pardon as an inducement to submit to the experiment. They were given a diet containing biscuits, corn bread, grits, rice, fried mush, brown gravy, sweet potatoes, and cane sirup, the average energy value of a day's ration being 2,952 calories. The entire population of the camp served as controls, but more especially 20 individuals who were under continuous surveillance similar to that of the subjects of the experiment. The general sanitary environment of the controls and subjects of the experiments was the same but personal cleanliness, cleanliness of quarters, and freedom of insects were decidedly better in the case of the subjects of the experiments.

Of the 11 volunteers who completed the experiment 6 developed symptoms which were diagnosed as pellagra. The first symptoms appeared in not later than five months after the beginning of the restricted diet. The conclusion is drawn that the pellagra in the 6 volunteers was the result of the restricted diet on which they subsisted.

The prevalence of pellagra.—Its possible relation to the rise in the cost of food, E. SYDENSTRICKER (*Pub. Health Rpts.* [*U. S.*], *30* (*1915*), *No. 43, pp. 3132–3148*).—In this report data are presented regarding the income and diet of workingmen's families, which were collected in investigations of family budgets. From a discussion of this data the following conclusions, in part, are drawn:

"The lower the economic status of the white American family, the greater is the pressure for sacrifices in diet, particularly in animal protein foods, since animal protein foods are the most expensive.

"The economic status of wage-earners' families in the Southern States, particularly of cotton-mill families, is lower than that of wage-earners' families in other sections of the country.

"Certain factors have tended to restrict the supply of protein foods in southern industrial localities that do not restrict, at least to the same extent, the supply of carbohydrates and hydrocarbons. Budgetary studies of a large number of native white wage-earners' families, generally comparable as to annual family income and size, indicate that the proportion of proteins in the diet of southern families is considerably less and of carbohydrates and of hydrocarbons considerably greater than in the diet of northern families. . . .

"The increase in retail food prices has been at least 40 per cent higher in proteins than in carbohydrates or in hydrocarbons.

"The available data thus point to a lessened financial ability of southern wage-earners' families to provide a properly balanced diet, as well as a decrease in the availability (measured by retail prices) of an animal protein food supply for the wageworking population, particularly since about 1907 or 1908."

The prevention of pellagra.—A test of diet among institutional inmates, J. GOLDBERGER, C. H. WARING, and D. G. WILLETS (*Pub. Health Rpts.* [*U. S.*], *30* (*1915*), *No. 43, pp. 3117–3131*).—The diet at two orphanages where pellagra had been endemic for several years was modified in accordance with the directions of the authors, as published in a previous paper (E. S. R., 32, p. 564). The modifications consisted chiefly in a marked increase in the amounts of fresh animal and leguminous protein foods and a reduction in the amount of carbohydrate food. The hygienic and sanitary conditions remained unchanged.

No evidence of a recurrence of the disease was observed in the 67 pellagrins in one institution, and no new cases developed among the 99 nonpellagrin residents, all of whom had been under observation for a year, since the change

in diet. In the other institution there was a recurrence in the case of only one of the 105 pellagrins and no new case in the 69 nonpellagrin residents.

Since a similar modification of the diet in certain wards of the Georgia State Sanitarium no evidence of recurrence in any of the pellagrins has been observed, although 47 per cent of the control pellagrins in wards where the diet had not been modified showed a recurrence.

"The conclusion is drawn that pellagra may be prevented by an appropriate diet without any alteration in the environment, hygienic or sanitary."

As a practical application of this experimental data, the author recommends the following modifications in the diet of a population where pellagra is especially prevalent: An increase in the amount of fresh animal and leguminous foods, especially during the late winter and spring, and a reduction in the diet of carbohydrate foods.

A bibliography is appended.

Changes in the hydrogen ion concentration of the blood produced by pulmonary ventilation, T. H. Milroy (*Quart. Jour. Expt. Physiol., 8 (1914), No. 2–3, pp. 141–153*).—Pulmonary ventilation experiments were conducted with air, air and oxygen, and gas mixtures rich in carbon dioxid for the purpose of determining the effect of these factors on the hydrogen ion concentration of the blood. Analyses were made of the blood of cats and dogs as the experimental animals. Among other conclusions, the author suggests that, due to the short duration of the variations of hydrogen ion concentration in the blood, this factor is closely related to the activity of the respiratory center.

A comparison of methods for determining the respiratory exchange of man, T. M. Carpenter (*Carnegie Inst. Washington Pub. 216 (1915), pp. 265, figs. 72, pl. 1*).—This publication reports in great detail an extensive study of the comparative value of several different methods of measuring the respiratory exchange in man. The forms of apparatus used in the investigation were the bed respiration calorimeter, the two types of the Benedict universal respiration apparatus, the Zuntz-Geppert apparatus, the Tissot method, the Douglas method, the Mueller valves, two forms of the Haldane gas-analysis apparatus, and a small hand spirometer. A detailed description of each of these types and the method of using them comprises the first part of the publication.

The results of the tests are reported in detail. Normal, healthy young men were used as subjects; during the experiments they usually were placed in a reclining position. The comparisons of two forms of apparatus were made under the same conditions and on the same day. Determinations were made of the elimination of carbon dioxid, the consumption of oxygen, the pulse rate, and the respiration rate. The muscular activity of the subject was also recorded. In some experiments a determination was made of the volume of respiration and the total ventilation of the lungs.

The third part of the publication is devoted to an extended critical discussion of the different types of respiration apparatus and their technique. Especial consideration is given to the sources of error and to the relative advantages and disadvantages of each method. In concluding the report, several pages are devoted to a discussion of a number of factors influencing the accuracy of the results obtained in these and other experiments on the respiratory exchange of man.

For the details of the discussion and of the experimental data the original publication should be consulted.

Energy transformations during horizontal walking, F. G. Benedict and H. Murschhauser (*Carnegie Inst. Washington Pub. 231 (1915), pp. 100, figs. 6, pl. 1*).—The object of this investigation was to study the increase in metabolism due to walking on a level at increasing rates of speed. An extensive review is

given of earlier studies of the gaseous metabolism during walking, and the results of 20 different investigations are summarized and compared on the basis of the movement of 1 kg. of weight through 1 meter of horizontal distance.

In the experiments here reported the subjects were athletes more or less trained to severe muscular activity. The walking was done in a specially designed treadmill. The universal respiration apparatus was employed in measuring the respiratory exchange. Values were determined for the carbon dioxid production and the oxygen consumption. Automatic records of the respiration rate and in some instances the pulse rate were also obtained. The distance walked in the case of each subject, the number of steps taken, and the height to which the body was raised during walking were also determined and recorded automatically.

To establish a base line with which to compare the metabolism during walking, preliminary experiments were carried out. In some of these the subjects stood with the body relaxed, in others they leaned against a support at the back, in others they leaned upon a staff, and in others they stood with muscles tense as in the position of "attention." In the walking experiments, the subjects walked at a slow speed, a medium speed, a very fast speed, and in some experiments were actually running.

The results of the experiments are reported in detail. In an extended discussion of the data reported, the authors consider the basal metabolism of the subjects as influenced by food and body position; the metabolism of the subjects during walking; the influence of the character of the diet on metabolism; the heat output per unit of work; the influence of fatigue on the heat output per unit of work; a comparison of the heat output per unit of work during running and walking; and an analysis of mechanics of locomotion. For the details of this discussion the original report should be consulted.

The gaseous metabolism of gymnasts, PELTRET and R. DU BOIS-REYMOND (*Arch. Anat. u. Physiol., Physiol. Abt., No. 3–4 (1914), pp. 251–272, fig. 1*).—A number of experiments are reported in which the Zuntz-Geppert method was used to measure the respiratory exchange of men engaged in unusual muscular activity. The data indicate, in the authors' opinion, that the favorable influence of gymnastics on the body may be best accomplished by avoiding extreme exertion and by increasing the actual amount of work done.

Exercise in education and medicine, R. T. MCKENZIE (*Philadelphia and London: W. B. Saunders Co., 1915, 2. ed., pp. 585, figs. 478*).—Some of the chapters in this book, especially those which have to do with the effect of physical exercise upon the muscles, heart, and lungs, and the relation of exercise to nutrition and excretion, are of interest to students of physiology.

ANIMAL PRODUCTION.

Feeds and feeding, W. A. HENRY and F. B. MORRISON (*Madison, Wis.: The Henry-Morrison Co., 1915, 15. ed., rev., pp. X+691*).—This is the fifteenth edition of this book (E. S. R., 10, p. 82), revised and entirely rewritten. A new series of standards, the "modified Wolff-Lehmann standards," has been formulated by the authors, based upon the recent findings of scientists in this and other countries. A new chapter on economy in feeding live stock has been added, together with other material changes looking toward a complete and practical guide to methods of feeding and animal nutrition.

Acidosis in omnivora and herbivora and its relation to protein storage, H. STEENBOCK, V. E. NELSON, and E. B. HART (*Wisconsin Sta. Research Bul. 36 (1915), pp. 19*).—This material has been previously reported from another source (E. S. R., 33, p. 368).

Notes on the fodder problem in India, J. MACKENNA (*Agr. Jour. India, 9 (1914), Nos. 1, pp. 38–58; 4, pp. 349–355*).—An account of drought-resisting fodder crops which grow in India.

The food value of Stizolobium pachylobium beans, H. S. SHREWSBURY (*Rpt. Dept. Agr. Barbados, 1913–14, pp. 27, 28*).—Examinations were made of *S. pachylobium* beans grown in Trinidad.

No evidence was found of the presence of cyanogenetic or other poisonous glucosids, saponins, fats, alkaloids, vegetable ptomaines, or toxalbumins. These beans are deemed superior in feeding value to French, Lima, or Java beans. and, like these beans, their nutritive properties are principally due to a high content of carbohydrates and proteins. Owing chiefly to the absence of fat, their value is considerably less than that of soy beans.

Mistletoe (*California Sta. Rpt. 1915, pp. 32, 33*).—The composition of mistletoe, which is said to be readily eaten by cattle and sheep in California, is given as follows:

Composition of mistletoe.

Part of plant analyzed.	Condition.	Water.	Protein.	Ether extract.	Starch, sugar, etc.	Crude fiber.	Ash.
		Per ct.	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*
Whole plant	Air-dried	12.00	9.94	7.13	51.57	15.14	4.22
Do	Fresh	56.88	4.77	3.49	25.37	7.42	2.07
Leaves	Air-dried	11.00	9.79	6.84	59.79	9.91	2.67
Do	Fresh	56.39	4.79	3.55	29.11	4.85	1.31
Stems and branches	Air-dried	13.50	7.95	7.61	48.29	16.43	6.22
Do	Fresh	57.61	3.89	3.73	23.68	8.05	3.04

Feeding almond hulls, G. H. TRUE (*California Sta. Rpt. 1915, pp. 35, 36*).—Pigs when fed an exclusive ration of almond hulls lost weight daily, but when given 1 lb. of barley for each 100 lbs. live weight and one-half as many almond hulls as constituted a full ration of these alone, a pound of gain was secured for each 10.26 lbs. of hulls fed in addition to the barley.

Where sheep were fed almond hulls and alfalfa hay the gains were unsatisfactory and could be practically accredited to the alfalfa hay alone.

The utilization of waste materials from breweries as foodstuffs, K. WINDISCH (*Pure Products, 11 (1915), No. 11, pp. 521–523*).—A discussion of the feeding of brewers' grains, waste yeast and sediment, and of spent hops, in Germany.

It is said that for each 50 to 60 bbls. of beer there is about 0.75 bbl. of thick sediment, consisting principally of yeast. Waste yeast and cask sediment are valuable feed material, being especially high in digestible protein. This material is converted into a feed stuff by drying. The yeast must be dried on cylinder or roller drying devices similar to those used in the production of potato flakes. From 5.5 bbls. of thickly fluid yeast about 220 lbs. of dry yeast is recovered.

Brewery waste materials must be carefully stored lest they undergo decomposition. The best procedure consists in storing the waste yeast and the cask sediment in well-fumigated kegs in a cold cellar.

Dry yeast contains from 52 to 58 per cent of protein, of which 90 per cent is digestible, up to 4 per cent of fat, of which 70 per cent is digestible, and from 25 to 30 per cent of carbohydrates, which are all digestible. Dry yeast stimulates the appetite, furthers the assimilation of the other foodstuffs, and, for certain diseases, displays a marked curative effect. It may be fed to horses,

cattle, pigs, sheep, and fowls, and in cows favorably influences the production of milk.

Where it is not possible to dry the waste yeast and the cask sediment these waste materials may be disposed of as cattle feed in a fresh condition, in which form they contain about 9 per cent protein. Prior to use they should be boiled or heated by live steam, thereby killing the yeast and other organisms. They should be freshly cooked for each feeding and given to the cattle while still warm. Owing to the slightly bitter taste the feeding of these materials should be gradual in order to accustom the cattle to the feed. The boiled liquid yeast may be mixed with chaff, chopped straw, or hay.

Spent hops have less nutritive value than any of the other brewery waste materials. This material is first pressed, dried and ground to fine meal, and then mixed with molasses. The spent hops may be fed in the fresh condition, in which state they contain 3.3 per cent of protein, of which about 25 per cent is digestible, and 5 per cent of carbohydrate, of which 60 per cent is digestible.

Commercial feeding stuffs, W. J. Jones, Jr., et al. (*Indiana Sta. Bul. 181 (1915), pp. 523–835*).—Analyses are reported of wheat bran, middlings, red dog flour, rye bran, rye middlings, rye red dog flour, buckwheat bran, buckwheat middlings, cotton-seed meal, cold-pressed cotton seed, cotton-seed hulls, linseed meal, distillers' dried grains, brewers' dried grains, malt sprouts, corn gluten feed, corn germ meal, corn bran, hominy feed, hominy meal, rice polish, dried sugar-beet pulp, alfalfa meal, dried blood, bone meal, meat meal, meat scrap, feeding tankage, ground rye, molasses feed, and various mixed and proprietary feeds.

Commercial feeds, J. M. Pickel, E. S. Dewar, and J. Q. Jackson (*Bul. N. C. Dept. Agr., 36 (1915), No. 10, pp. 53*).—Analyses are given of wheat bran, middlings, shorts, shipstuff, red dog flour, molasses feeds, cotton-seed meal, corn chop, rice polish, rice meal, rye middlings, dried-beet pulp, meat meal, beef scrap, distillers' dried grains, and various mixed and proprietary feeds.

Analyses of feed stuffs, A. Scholl (*Ber. Landw. Vers. Stat. Münster, 1914, pp. 18–27*).—Analyses are given of the following feeding stuffs: Soy-bean meal, rice meal, peanut meal, linseed meal, palm-kernel cake, cotton-seed meal, rapeseed cake, sesame cake, coconut cake, and fish meal.

Biology and its makers, W. A. Locy (*New York: Henry Holt & Co., 1915, 3. ed., rev., pp. XXVI+477, figs. 125*).—This book treats of the sources of biological ideas and of the doctrine of organic evolution.

The growth of organs in the albino rat as affected by gonadectomy, S. Hatai (*Jour. Expt. Zool., 18 (1915), No. 1, pp. 1–67; abs. in Jour. Roy. Micros. Soc., No. 5 (1915), pp. 460, 461*).—In experiments with albino rats to test the effect of the removal of the sex glands in either sex, which the author calls gonadectomy, applying the term both to castration of the male and spaying of the female, five operations were performed: Total gonadectomy, partial gonadectomy, ligature of the spermatic cord, removal of one ovary followed by an isolation of the other ovary from the uterus, and the isolation of both ovaries from the uterus.

"The body lengths were slightly less in all the rats operated on, except the spayed females, in which the body lengths were distinctly greater. The tail length with respect to the body length tends to be slightly longer in the castrated males. The body weight in respect to body length is greater in nearly all rats operated on, but especially in the spayed rats. In castrated and spayed rats the bones (femur, tibia, fibula, humerus, radius, and ulna) tend to be very slightly longer and heavier than in the corresponding controls and the percentage of water in the bones slightly higher. No characteristic response was observed for the central nervous system.

"In the semispayed series the compensatory growth of the remaining ovary is almost perfect as it attains nearly twice its normal size. In the semicastrated the remaining testis showed an increase of 14 per cent, but this may be solely in the interstitial tissue. The isolated ovaries survived and grew as if they had been connected with the uterus. In the case of isolation of the ovary followed by semispaying the remaining isolated ovary hypertrophies in the same manner as that of the semispayed rat. The ligation of the spermatic cord may cause a complete atrophy of the testes and alterations of somatic characters similar to those in castrated rats. No definite conclusions could be drawn in reference to the thyroid gland, which is very variable in weight.

"In castrates the suprarenals show an increase, in spayed rats a decrease. When the spermatic cords are ligatured (and the testis absorbed) the suprarenals show reactions similar to those following castration. The thymus increases to about twice its size after gonadectomy. It seems not only to delay its normal involutionary process but actually to increase in weight. The weight of the hypophysis is increased on the average by 50 per cent after removal of the testis or after ligature of the spermatic cord (and absorption of the testis). On the other hand, spaying produced only a slight increase (about 8 per cent on the average).

"After removal of the sex glands and compensatory growth of the hypophysis, there is no overgrowth of the body or obesity. But these responses appear when the enlargement of the hypophysis does not occur—in the spayed rats, for example. In the semispayed and semicastrated, neither enlargement of the hypophysis nor obesity occurs, for the enlargement of the remaining gonad enables it to furnish the normal amount of gonadin. The total removal of the gonads tends to increase the resemblance between the two sexes, or it may be said that gonadectomy favors the production of the secondary sex characters of the opposite sex."

A bibliography of literature cited is given.

On the presence of interstitial cells in the chicken's testis, T. B. Reeves (*Anat. Rec., 9 (1915), No. 5, pp. 383–386, figs. 3*).—The author calls attention to Alice M. Boring's conclusion (E. S. R., 27, p. 869) that there are no interstitial cells present at any time in the testes of chickens from one day to 12 months old, and to the work of J. des Cilleuls (E. S. R., 28, p. 668), who found interstitial cells from the thirteenth day onward. The author examined the testes from cocks 5½, 9, and 18 months old, and found interstitial cells in all the stages examined.

A fossil ruminant from Rock Creek, Texas; Preptoceras mayfieldi n. sp., E. L. Troxell (*Amer. Jour. Sci., 4. ser., 40 (1915), No. 239, pp. 479–482, figs. 3*).—A description of a skull of ruminant found among fossil remains in Texas.

"The skull resembles somewhat that of the ox, especially in the general form and position of the horns, which come out in the plane of the face, tending upward, then downward and forward. At first it was taken to be the skull of a sheep, but it is found to be very different. It is about one-half larger than a skull of *Ovis rockymontanus* and the horns, which are not so large, do not curve backward nor are they set close together."

The Central-German red cattle breed, J. Schmidt (*Arb. Deut. Gesell. Züchtungsk., No. 19 (1914), pp. 112, pls. 14*).—An account of the breed characteristics, utility value, and distribution of the Central-German red cattle, together with measurements and comparisons with other breeds.

Shorthorn conditions in Argentina, F. W. Harding (*Breeder's Gaz., 68 (1915), No. 13, pp. 494, 496*).—The principal exposition of Argentina is held annually during August at Palermo. This year approximately 1,200 pedigreed Shorthorns were on exhibition. It is said that in quality the winners were equal

in every way to our own champions and first-prize winners. The cattle business generally in South American countries is reported as in excellent condition, due in part to competition produced by unusually large operations by United States packers.

Feeding in South Texas, H. M. Madison (*San Antonio, Tex.: Publicity League Chamber Com., 1914, pp. 18, figs. 9*).—In this pamphlet a chart is given showing the relative cost of meat production in the several sections of the United States, it being estimated that the average cost per pound of gain in fattening cattle in the South is 5.5 cts. and in the North, 9.41 cts.

Oil meal as a food for skim-milk fed calves (*California Sta. Rpt. 1915, p. 35*).—Two lots of eight calves each were fed a grain mixture of ground oats, ground barley, and wheat middlings 2 : 2 : 2, one lot receiving 1 part of linseed meal in addition to this mixture. Three other lots of eight calves each were fed a grain mixture of ground milo maize and rolled barley 3 : 2, two of the lots receiving 1 part of linseed meal in addition. The results of this experiment indicate that the addition of oil meal to the grain ration does not materially affect the gains made by skim-milk fed calves or the cost of the gains. Some advantage was noticed, however, as regards the thriftiness of the calves receiving the oil meal.

Wool authorities at San Francisco, J. M. Jones (*Breeder's Gaz., 68 (1915), No. 13, p. 498*).—A meeting of sheep and wool specialists was held at San Francisco from August 9 to 11, 1915. The chief topic under consideration was the Australian system of shearing and classifying wool. The general sentiment was in favor of the improved method, and it was urged that the question of improved wool marketing be put before the sheepmen of the range States.

Goat breeding, A. Machens (*Das Wissen des Ziegenzüchters. Ratisbon: Josef Habbel, 1914, pp. 142, figs. 25*).—A general discussion of methods of breeding, feeding, care, and management of goats in Germany.

Soiling v. pasturing grain-fed pigs (*California Sta. Rpt. 1915, p. 35*).—In experiments in which two lots of 15 pigs each received the same amount of barley, lot 1 receiving alfalfa as soilage and lot 2 being pastured on alfalfa, it was found that the economy of soiling *v.* pasturing depends on the cost of labor and the location of the alfalfa field in relation to the hogpens. Only one-tenth of an acre was cut for soiling during a period of 10 weeks, while four-tenths of an acre was used for pasturing. The soiling lot received 5 per cent more barley for a pound of gain than the pasture lot. The pigs on pasture were larger framed when marketed but not quite so fat as those from the soiling lot.

Animal husbandry, R. Withycombe (*Oregon Sta., Rpt. East. Oreg. Sta., 1911–12, pp. 41–58*).—Four lots of four hogs each fed for eight weeks all they would eat of chopped grains, lot 1 receiving hull-less barley, lot 2 wheat, lot 3 field peas, and lot 4 rye, made total gains during the period of 76.5, 89, 124, and 61.5 lbs. per pig and consumed per pound of gain 4.75, 4.23, 3.34, and 4.4 lbs. of grain for the respective lots. The gains made varied in direct proportion to the amount of feed consumed, those consuming the largest amounts of grain producing the most gain.

In a similar test with smaller hogs, lot 1 receiving wheat and lot 2 peas, the total gains for eight weeks were 77.57 and 88.43 lbs. per pig, requiring 4.05 and 3.56 lbs. of grain per pound of gain for the respective lots.

In an experiment to determine the relative feeding value of supplementary feeds in connection with a grain ration, two lots of four hogs each were fed eight weeks a full grain ration of barley, lot 1 also receiving all the sugar beets they would eat and lot 2 all the alfalfa hay they would eat. They made total gains for the period of 68.25 and 86.5 lbs. per pig, lot 1 consuming 4.18 lbs. of barley and 0.34 lb. of sugar beets, lot 2 3.41 lbs. of barley and 0.41 lb. of alfalfa

per pound of gain. The hogs fed on chopped barley and alfalfa hay seemed to have keener appetites than did those which were fed sugar beets. It is thought that the sugar-beet ration contained too much carbohydrates and not enough protein.

A lot of four hogs fed eight weeks rye and alfalfa hay made total gains during the period of 79.5 lbs. per pig, consuming 3.89 lbs. of rye and 0.34 lb. of alfalfa hay per pound of gain, while a similar lot receiving rye and steamed alfalfa hay gained 88.25 lbs. per pig, consuming 3.73 lbs. of rye and 0.31 lb. of steamed alfalfa hay per pound of gain. The difference in favor of the steamed alfalfa was deemed too slight to justify the steaming process.

Two lots of pigs fed eight weeks, lot 1 barley alone and lot 2 barley and alfalfa hay, made total gains during the period of 71.71 and 91.43 lbs. per pig, lot 1 consuming 4.27 lbs. of barley and lot 2 3.73 lbs. of barley and 0.26 lb. of alfalfa hay per pound of gain. From this test it is deemed quite evident that grain should be supplemented with other feeds. This experiment was carried on during the winter months, and it is thought that still greater returns may be had by feeding at the time of the year when the hogs may have access to alfalfa pasture in connection with a full grain ration.

Two lots of pigs were fed eight weeks as follows: Lot 1 barley and tankage 9:1, lot 2 barley and peas 7:3 (both rations containing practically the same amount of protein). They made total gains for the period of 92.86 and 94 lbs. per pig, lot 1 consuming 2.43 lbs. of barley and 0.37 lb. of tankage, and lot 2 2.21 lbs. of barley and 1.04 lbs. of peas per pound of gain. In a second similar experiment, substituting wheat for barley, the lots made total gains for the period of 75.98 and 83.85 lbs. per pig, lot 1 consuming 2.74 lbs. of wheat and 0.41 lb. of tankage and lot 2 2.60 lbs. of wheat and 1.11 lbs. of peas per pound of gain.

Four lots of eight pigs each fed five weeks, lots 1 and 2 by the self-feeder method and lots 3 and 4 by the ordinary daily ration method, made total gains during the period of 81.12 and 70.87 lbs. per pig, lot 1 consuming 3.94 lbs. of grain and lot 2, 4.02 lbs. per pound of gain. In a second experiment four lots of pigs were fed eight weeks, lots 1 and 2 being self-fed, lot 1 receiving bald barley and lot 2 peas; and lots 3 and 4 receiving daily rations, lot 3 receiving barley and lot 4 peas. They made total gains for the period of 95.96, 100.85, 83.72, and 84.86 lbs. per pig, lot 1 consuming 3.93 lbs. of barley, lot 2, 3.66 lbs. of peas, lot 3, 3.7 lbs. of barley, and lot 4, 3.69 lbs. of peas per pound of gain.

In an experiment to determine the feeding value of ripe as compared with green peas when hogged off in the field, two lots of 25 pigs each fed four weeks, lot 1 on ripe peas and lot 2 on green peas, made total gains for the period of 30.4 and 38.4 lbs. per pig, lot 1 producing 380 lbs. of pork to the acre valued at $26.60, and lot 2, 480 lbs. of pork, valued at $33.60. In a similar experiment in hogging off field peas two lots of 18 pigs each were fed four weeks as follows: lot 1 Canadian field peas and kale, lot 2 peas alone. They made total gains for the period of 50.23 and 45 lbs. per pig, lot 1 producing 452.07 lbs. of pork per acre valued at $36.17, and lot 2, 405 lbs. of pork per acre valued at $32.40. The results of these two experiments would seem to indicate that green feed in connection with grain rations is an important factor in fattening hogs.

In an experiment to determine how to feed young growing pigs in order that they may make their growth most economically, a lot of light hogs weighing approximately 78 lbs. each and a lot of comparatively heavy hogs weighing 111 lbs. were fed on alfalfa pasture and a small grain ration. It was found that on a ration of 3 lbs. of chopped barley for each 100 lbs. of live weight the lighter hogs produced the better returns.

Eighteen pigs, averaging 66.67 lbs. in weight, on alfalfa pasture and a daily ration of ⅚ lb. chopped barley per pig made a satisfactory growth, yet the gain

in weight was not large. Pigs weighing 73.12 lbs. per head on straight alfalfa pasture appeared to make some growth, but at the end of the test their actual weight was less than at the beginning. It is concluded that matured hogs seem to hold their condition very well when on alfalfa pasture, but a young, growing pig will not thrive without some grain in addition to the alfalfa pasture.

In an effort to work out a maintenance ration of chopped barley and alfalfa hay for brood sows two sows were started on a daily ration of 5 lbs. of barley and 2 lbs. of alfalfa hay. At the end of each week they were weighed. If it was found that they had gained in weight their rations were reduced, and if they lost their rations were increased. Sow No. 1 lost, in 13 weeks, 17 lbs. on a daily ration of 2.12 lbs. of chopped barley and 0.61 lb. of alfalfa hay for each 100 lbs. of live weight, while sow No. 2 gained 33 lbs. on a ration of 1.48 lbs. of barley and 0.58 lbs. of alfalfa hay for each 100 lbs. of live weight. In a second experiment with three sows it was found that the nearest to a maintenance ration was that in which 1.27 lbs. of barley and 2.55 lbs. of sugar beets per 100 lbs. of live weight were fed. When a wheat and alfalfa hay ration was fed, two sows made a considerable gain in weight, while one sow lost 7 lbs. during the test. Rye as a winter feed for brood sows produced very desirable results as a maintenance ration, one sow making a gain in weight in 13 weeks of 93 lbs. on a ration of 1.88 lbs. of rye per 100 lbs. of live weight.

From a general summary of these tests in feeding brood sows it is thought that the ration of barley and alfalfa hay is the most desirable. It appears that 1.78 lbs. of barley and 0.59 lb. of alfalfa hay per 100 lbs. of live weight makes a very good maintenance ration for a brood sow during the winter. It is thought that by careful feeding, the alfalfa portion of the ration might be increased and the grain portion decreased and still produce equally good results.

A detailed plan for a 40-acre hog farm is outlined, it being estimated that approximately $800 for profit and wages of the man in charge could be realized.

Establishing the swine industry on the North Platte reclamation project, C. S. Jones (*U. S. Dept. Agr., Bur. Plant Indus., Establishing the Swine Industry on the North Platte Reclamation Project, 1915, pp. 26, figs. 5*).—A general description of the North Platte reclamation project, embracing about 100,000 acres of irrigable land in Nebraska and Wyoming, with a discussion of the adaptability for and extent of the swine industry on the project, including an introduction by F. D. Farrell.

Information has been collected relative to the various methods of management in operation.

Hog cholera has made its appearance on the project, most of the outbreaks occurring in July, August, September, and October. It is thought that the large number of outbreaks during these months was due chiefly to the relatively high temperatures and to the greater use of irrigation water during that period. It was definitely ascertained during the summer that about 36 per cent of the outbreaks resulted from infection carried by irrigation water. Losses of hogs that were treated for cholera averaged from 6.2 per cent in November to 21.7 per cent in August. The mortality resulting was much higher in young pigs than in mature hogs, averaging with pigs weighing less than 15 lbs. about 95 per cent; with shoats weighing from 15 to 125 lbs. about 85 per cent; and with mature hogs about 25 per cent. The physical condition of the hogs was found to be an important factor in reducing the mortality of treated hogs.

Marketing the 1915 hog crop, W. H. Peters (*North Dakota Sta. Circ. 9 (1915), pp. 14, figs. 9*).—This circular treats of the status of the hog industry in North Dakota and gives directions for the feeding, care, and management of the breeding herd and the fattening of hogs for market.

California hog book, W. S. GUILFORD (*San Francisco: Pacific Rural Press, 1915, pp. 252, pls. 31, figs. 22*).—This is a compilation of information about hogs applied to California conditions.

The Cape horse: Its origin, breeding, and development in the Union of South Africa, P. J. VAN DER SCHREUDER (*Thesis, Cornell Univ., 1915, pp. 122*).—The author reviews the history of horse breeding in South Africa and tells of the development of the Cape horse, which, although not recognized as a breed in itself, is a type of horse particularly adapted to the needs of that country. This horse gained considerable fame as a remount in the British army. The Cape horse owes his best qualities to Arabian and Thoroughbred stock. It is thought that with intelligent grading and selection and an efficient government control South Africa will be able to put in the market a horse equal to the best of any country.

Modern horse management, R. S. TIMMIS (*London and New York: Cassell and Co., Ltd.* [*1915*], *pp. XV+233, pls. 144*).—Chapters included in this work are the history of the horse, psychology of the horse, feeding, grooming and stable management, driving and harness, riding and saddle, stable construction, diseases and treatment, anatomy and use of the horse's tail, shoeing and care of the feet, and use and abuse of bearing-reins.

The education of the horse, W. J. NEAL (*Garland, Mont.: Author, 1915, pp. 44, figs. 7*).—This pamphlet treats of methods of care and management of the horse.

[Poultry investigations], J. E. DOUGHERTY (*California Sta. Rpt. 1915, pp. 37, 38*).—Tests indicate that the best average temperature for an incubator is 102° F. when the bulb of the thermometer is on a level with the top and touching a fertile egg. If, however, the thermometer is above and not touching the eggs, the incubator should be started at a fairly high temperature and this temperature gradually lowered as the hatch progresses.

A check pen of 50 2- and 3-year-old hens without high protein feed laid 102.1 eggs per hen during the year. Hens of similar character and fed high protein in addition gave the following number of eggs per hen per year: On soy bean meal, 104.9; meat scrap, 129.7; fish scrap, 131.7. When properly fed, fish scrap did not in any way taint the eggs laid.

Five pens of 33 hens each were fed a grain mixture consisting of whole wheat, whole barley, and cracked corn or whole Egyptian corn 150:100:50, also a dry mash consisting of bran, shorts, charcoal, and salt 50:50:5:1, to which was added either 30 parts of meat scrap alone or 30 parts of a high protein ration consisting of a combination of meat scrap with soy bean meal or linseed meal. The average amount consumed per hen per year in the five lots was 49.5 lbs. of grain and 23.5 lbs. of dry mash. The average number of eggs laid per hen was 142. The average cost per dozen eggs of grain and mash consumed was 10.5 cts. In this trial no advantage was found in a mixture of vegetable and animal protein over feeding animal protein alone. Buttermilk at 20 cents per 100 lbs. was found to be a satisfactory and economical substitute for meat scrap at $3.25 per 100 lbs.

Poultry breeding, R. R. SLOCUM (*Jour. Heredity, 6 (1915), No. 11, pp. 483–487*).—The author reviews the experimental work of geneticists during the last 15 years, it being pointed out that, while the work has shown the mode of inheritance of many characters, it has not materially modified practical methods of commercial breeders.

A hen that crowed (*Jour. Heredity, 6 (1915), No. 11, p. 482, fig. 1*).—A description is given of a Buff Orpington hen, hatched at the experimental farm at Beltsville, Md., which laid 110 eggs and in August began to molt. Following the molt she began to develop the secondary sexual characters of the male; the

tail feathers changed in appearance, the comb increased in size, the head came to look more like that of a cock, and the legs took on the redness characteristic of the male Buff Orpington. She was observed to crow several times; she occasionally visited the nest but never laid an egg. Later she was killed. Dissection showed no evidence of any development of male reproductive organs, but disclosed a large tumor on the ovary. It is thought that this growth, by inhibiting the secretions connected with femaleness, had allowed the male characters to become apparent; for there is reason to believe that every fowl has the potential ability to develop the characters of either sex.

Poultry culture; sanitation and hygiene, B. F. KAUPP (*Philadelphia and London: W. B. Saunders Co., 1915, pp. 418, figs. 197*).—This book contains chapters on the breeds of poultry, problems of mating, hygiene and sanitation, construction of poultry houses, diseases and parasites, rations and methods of feeding, broilers and dressing of fowl, care and marketing of feathers, incubation and brooding, marketing eggs, caponizing, and preparing birds for show.

Skunk culture for profit, F. M. HOLBROOK (*Chicago: Skunk Development Bureau, 1915, pp. 119, figs. 38*).—A general discussion of methods of breeding, feeding, management, skinning, and marketing of skunks.

DAIRY FARMING—DAIRYING.

[Dairy investigations] (*California Sta. Rpt. 1915, pp. 33, 34, 37*).—From the results of feeding trials in which barley was the sole concentrate fed, it appears that there is no foundation for the statement often made that barley has an unfavorable influence on the milk secretion and tends to dry up the cows. Other tests of feeding barley have been noted (E. S. R., 33, p. 575).

Data thus far collected show proportionately less sterility in dairy cattle fed exclusively on alfalfa than in those fed partly on alfalfa or in those receiving no alfalfa at all, thus negativing the popular opinion that alfalfa is the cause of sterility.

L. M. Davis found that butter made in whole-milk creameries had better keeping quality than that made in the average gathered-cream plant. Pasteurization of old cream did not insure good keeping quality in butter made therefrom. The average score of 12 cubes of fresh California June butter, selected from an entry of the Educational Butter Scoring Contest, was 92, After being held 14 weeks it was 88.5, thus showing considerable depreciation during storage.

Feeding dairy cows in Washington, A. B. NYSTROM (*Washington Sta. Popular Bul. 92 (1915), pp. 24*).—General directions, on the basis of available data summarized, are given for feeding cows under Washington conditions.

Milk records in Berks and Bucks, 1913–14, J. MACKINTOSH (*Univ. Col. Reading, Dept. Agr. and Hort. Bul. 25 [1914], pp. 112, pl. 1*).—From records kept of the milk yields of 39 herds it appeared that cows calving from August to March may be expected to give from 100 to 150 gal. more milk per annum than those calving in May and June. Cows calving from July to December apparently have slightly longer milking periods, the chief reason being the change from winter feeding to the fresh grass of early summer.

World's champion Red Poll, "Muria," R. R. KERR (*Jour. Dept. Agr. Victoria, 13 (1915), No. 9, pp. 541–544, fig. 1*).—The Red Poll cow Muria produced in one year 14,972 lbs. of milk containing 884.16 lbs. of milk fat, which is said to be the record production for that breed.

Milking Shorthorn association formed (*Breeder's Gaz., 68 (1915), No. 14, p. 569*).—Announcement is made of the formation of the American Milking Shorthorn Breeders' Association, with headquarters at St. Paul, Minn. Ani-

mals will be registered as foundation stock until the end of 1918 under the following conditions: Animals imported from England, though not recorded, that can be shown on sworn testimony to be descended from not fewer than four generations of recorded Shorthorn sires in the case of females and five in the case of males, and that measure up to the requirements called for; animals bred in America that can measure up to the standard called for in the case of unrecorded imported Shorthorns. Before the progeny of recorded animals can be recorded they must be the progeny of recorded dams that have weighed not less than 1,200 lbs. at 30 months old, or not less than 1,400 lbs. at the age of 36 months; of heifers with their first calf that have produced not less than 3,000 lbs. of milk during the first 6 months of lactation, or not less than 4,500 lbs. during the first year; and of cows at 4 years or over that have produced not less than 6,000 lbs. of milk in a year.

Milch goats, G. H. True (*California Sta. Rpt. 1915, p. 36*).—Three milch goats completed a year's record as follows: A 2-year-old pure Toggenburg, 2,158 lbs. of milk and 72.8 lbs. of milk fat; a 2-year-old Toggenburg, 1,118 lbs. of milk and 40.7 lbs. of milk fat; and a yearling-grade Toggenburg, 1,283 lbs. of milk and 49.73 lbs. of milk fat. The feed cost of 1 lb. of milk from these goats was approximately 90 per cent that of 1 lb. of milk of a similar average fat content produced by a group of 5 cows in the university dairy herd.

The American milch goat record (*Dayton, Ohio: American Milch Goat Record Assoc., 1914, vol. 1, pp. 86*).—This is the first volume of this record and contains 900 pedigrees, with an index to owners.

Profit and pleasure in goat keeping, F. C. Lounsbury (*Plainfield, N. J.: Author, 1915, pp. 43, figs. 23*).—A description of the principal breeds of goats, together with instructions on their feeding, care, and management.

The quantity and quality of milk secreted from the four quarters of the udder, E. Goldoni (*Atti Soc. Nat. e Mat. Modena, 5. ser., 1 (1914), pp. 69–86*).—The author in his tests of a number of cows found very little difference in the relative quality of milk from the four quarters of the cow's udder, but the quality varied with the individual. However, with all the cows the hind quarters showed a slightly larger yield.

A bibliography of references is included.

The action of pituitrin on the secretion of milk, A. L. I. Maxwell and A. C. H. Rothera (*Jour. Physiol., 49 (1915), No. 6, pp. 483–491*).—The authors found in their studies that "pituitrin" injections cause a gradual rise of milk pressure. This increase of pressure was maintained for at least 17.5 minutes in a goat and at least 40 minutes in a cow. In the goat pituitrin causes extra milk to be available to the milker for a considerable time. If the effects were due to muscular contraction, it is thought that they would rapidly reach a maximum and then decline. In cats about 60 per cent of the milk is preformed in the gland after 6 to 7 hours' interval and about 40 per cent is secreted during suckling, indicating that suckling causes a true secretion. The effect of suckling is, so far as has been investigated, the same as that of pituitrin, and it is concluded that pituitrin also causes a true secretion.

On the composition of milk as affected by increase of the amount of calcium phosphate in the rations of cows, A. Lauder and T. W. Fagan (*Proc. Roy. Soc. Edinb., 35 (1914–15), No. 2, pp. 195–202*).—Two lots of three dairy Shorthorn cows each were fed turnips, cotton-seed cake, bran, hay, and straw, the mineral matter in this ration, exclusive of the straw, containing about 0.5 lb. of calcium phosphate per cow per day. On this ration the percentage of phosphoric acid and mineral matter in the milk of each cow was relatively constant. Lot 1 was kept on this ration throughout, while lot 2 was fed in addition for five weeks calcium phosphate in the following quantities: For the first

3 days, 2 oz. per cow per day; for the next 4 days, 4 oz.; for the next 7 days, 7 oz.; and for the next 21 days, 8 oz. The addition of calcium phosphate was then stopped and the original ration continued for two weeks.

The addition of calcium phosphate did not increase the amount of phosphoric acid in the milk. The extra calcium phosphate did not effect an increase in the percentage of fat, ash, or solids-not-fat. No definite effect on the yield was observed.

On the diffusible phosphorus of cow's milk, H. S. H. WARDLAW (*Jour. and Proc. Roy. Soc. N. S. Wales, 48 (1914), pt. 2, pp. 253–266*).—This paper is an account of the application of the method of quantitative dialysis to the study of the diffusible phosphorus of cow's milk.

It was found that when a large volume of milk is dialyzed against a small volume of water the freezing point of the dialyzate after 24 hours approximated to that of the milk, and did not change as the dialysis was continued; a definite state of equilibrium was therefore reached. Milk freed from fat in a centrifuge contained 3 per cent more ash-forming substances than whole milk. The diffusible calcium of cow's milk amounted to from 30 to 40 per cent of the total present, and the diffusible phosphorus to from 35 to 55 per cent.

A list of references relating to the subject is included.

On the nature of the deposit obtained from milk by spinning in a centrifuge, H. S. H. WARDLAW (*Jour. and Proc. Roy. Soc. N. S. Wales, 48 (1914), pt. 2, pp. 152–171, fig. 1*).—The author summarizes the results of his studies as follows:

"The removal of suspended matter from milk by spinning in a centrifuge does not lower the freezing point of the milk. The rate of deposition of the suspended matter of milk in a centrifuge is not constant, first decreasing then increasing. The amount of ash in the deposit shows a variation in the opposite direction to that of the rate of deposition, first increasing then decreasing. . . . The percentages of calcium and of phosphorus in the ash of the deposit are not subject to much variation; the average values are CaO 43.1 per cent, P_2O_5 43.9 per cent. The nitrogen content of the deposit is also fairly constant; its average value is 11.5 per cent. . . . The average composition of the deposit is ash 8 per cent, caseinogen 57 per cent, other protein 16 per cent, lactose 16 per cent, other non-nitrogenous organic matter 3 per cent. A considerable portion (25 to 70 per cent) of the deposit is soluble in water. The soluble portion contains the bulk (up to 90 per cent) of the ash of the deposit."

A list of references relating to the subject is included.

What can be added to our laboratory methods and standards to improve certified milk, J. TRAUM (*Amer. Jour. Vet. Med., 10 (1915), No. 10, pp. 717–722, 748*).—This paper, which was presented at the ninth annual meeting of the American Association of Medical Milk Commissions, June 17, 1915, discusses various laboratory methods for the determination of the bacterial content of milk and makes suggestions as to their improvement.

Experiments conducted by Stabler and Cooke at the veterinary science laboratory of the University of California to determine to what extent clarification would improve certified and other milks are reported. It was found that the decrease of cellular elements is constant, varying from 70 to 86 per cent; that while the slime per cubic centimeter contains from 36 to 2,000 times as many bacteria as the original milk, the final product yields a bacteria count that is not very much different from the count before clarification; and that the clarifier has a capacity of removing only a limited amount of slime at one time, since a fourth clarification of the same sample did not yield a smaller amount of slime by weight than the first clarification.

A bacteriological method for determining manurial pollution of milk, J. Weinzirl and M. V. Veldee (*Amer. Jour. Pub. Health, 5 (1915), No. 9, pp. 862–866*).—It is said that the use of *Bacillus sporogenes* as an indicator of manurial pollution in milk possesses decided advantages over the *B. coli* test. Since the organism is a spore producer and goes over into the spore stage under ordinary temperatures, it can not be destroyed by pasteurization, so that this test can be employed on all classes of milks, including pasteurized milks where the *B. coli* test is worthless, and centrifugalized or clarified milks where the sediment filter test becomes useless.

The method employed consisted in the use of plain test tubes and milk samples. To secure aerobiosis sufficient sterile paraffin was added to the tube to make a layer one-eighth of an inch or more in thickness. The tube, containing the sample of milk and paraffin, was heated to 80° C. for 10 minutes, cooled, and incubated. If *B. sporogenes* was present the lactose was digested under the anaerobic conditions and the gas formed raised the paraffin plug some distance up the tube. If *B. vulgaris* was present, digestion without gas formation ensued.

The relative resistances to infection of raw, pasteurized, and boiled milk, Lucy D. Cripps and J. E. Purvis (*Jour. Roy. Sanit. Inst., 36 (1915), No. 9, pp. 391–393*).—To raw, pasteurized, and boiled milk samples was added 0.05 cc. of a dilute emulsion of *Bacillus coli* (24 hours' growth), incubated at room temperature and at 37° C. for 2, 4, 6, and 24 hours, and the increase in the number of bacteria noted.

It was found that the organisms increased much more rapidly in the pasteurized and boiled milks than in the raw milk, and in the boiled than in the pasteurized. The increase was strikingly apparent in the 2, 4, and 6 hours' incubations, and it was noticeable that although the relative increase in the pasteurized and boiled milks was not so prominent in the 24 hours' incubation there was an actual decrease in the raw milk. It is thought that chemical changes take place during the heating process, which make the constituents of milk more suitable for the assimilation by and growth of micro-organisms. Also, "the enzyms of milk undergo definite changes by heat, and, in fact, are destroyed when the milk is boiled. It may be that these enzyms are responsible for the germicidal power of raw milk, whereas in boiled milk they are absent because they have been destroyed; or, again, it has been suggested that the destruction of the lactic-acid bacillus by pasteurization facilitates the growth of undesirable bacilli; or, again, where there is a mixture of saprophytic and pathogenic bacteria the condition of the raw milk favors the growth of the saprophytic type rather than of the pathogenic."

It is concluded from these observations that milk should be pasteurized or boiled immediately before it is consumed.

Immunized milk in the prophylaxis and treatment of typhoid fever, J. Rosenberg (*Med. Rec. [N. Y.], 88 (1915), No. 17, pp. 695, 696*).—The author presents evidence tending to show that cows and goats immunized with dead cultures of the typhoid bacillus develop in their milk specific antibodies, agglutinins, and precipitins; that feeding this milk to animals or human beings conveys passive immunity and protection against the typhoid bacillus; and that ingestion of this milk causes the production of specific antibodies in the circulation, so that the blood, at first negative, responds to the agglutination test. From these observations it is assumed that "immunized milk would provide protection against typhoid infection, a prophylactic like antityphoid vaccination without its risk and the usual symptoms of discomfort." It is also maintained that immunized milk is a rational remedy for treating typhoid fever, especially in the earliest stages, deserving preference to ordinary milk.

Do we need a law regulating moisture in cheese? C. F. DOANE (*Hoard's Dairyman, 50* (*1915*), *No. 13, pp. 386, 387*).—The author comments on the increasing difficulty of securing good American cheese, the principal criticisms being the softness of the cheese and its poor keeping quality. It is thought that if quality is to be placed where it should be for the good of the cheese industry, the State or nation must regulate the moisture content of cheese, as has been done with butter. A 40 per cent limit is deemed high enough to allow for unavoidable variations and to insure a much better cheese than the average product of any State at the present time.

The composition of Dutch cheese and the system of control for whole-milk Dutch cheese, J. J. L. VAN RIJN (*Analyst, 40* (*1915*), *No. 474, pp. 391–398*).—Descriptions are given of the Edam and Gouda varieties of Dutch cheese. Both varieties were originally made of whole milk. Edam cheese, however, is now mostly made from the mixture of the evening milk from which a little cream has been taken off by hand and the whole morning milk. Genuine Gouda cheese is nearly exclusively made of whole milk. However, skim-milk cheeses having the well-known shapes of Edam and Gouda varieties have appeared upon the market, with the result that it is not possible to differentiate from the appearance between the original full-cream article and the "half-meat," or skimmed, imitation.

The author points out that while there is no direct relation between the amount of fat in the milk and in the cheese, it is possible to guarantee a minimum of fat when the cheese is properly made from whole milk. Rich milk, however, does not necessarily mean a high percentage of fat in the cheese, even when carefully made and when little fat is lost in the whey.

The results of investigations show that the increase in the percentage of fat in skim milk has a very marked effect on the increase of the amount of fat in the cheese. Cheese made from skim milk with 0.5 per cent fat showed an average percentage of fat in the dry matter of the cheese of 12.45 per cent, while with a fat content of the milk of 2 per cent the fat in the cheese was 38.65 per cent. An increase of 0.1 per cent in the amount of fat in the skim milk was found to give, on an average, an increase of 1.75 per cent of fat in the dry substance of the cheese.

An account is given of several control stations in Holland organized by private individuals and under supervision of the Government which have adopted marks for distinguishing the whole-milk cheese.

VETERINARY MEDICINE.

Report of the eighteenth annual meeting of the United States Live Stock Sanitary Association (*Rpt. U. S. Live Stock Sanit. Assoc., 18* (*1915*), *pp. 252, figs. 24*).—The papers presented at the eighteenth annual meeting are as follows: Foot-and-Mouth Disease, by A. D. Melvin and J. R. Mohler (pp. 16–27) (E. S. R., 32, p. 877); Foot-and-Mouth Conditions in Various States (pp. 27–66); Recent Developments in Tick Eradication, by P. F. Bahsen (pp. 67–77); The Use of Concrete for Sanitary Farm Improvements, by L. A. Warner (pp. 77–91); The Recognition of Atypical Forms of Blackleg in the United States, by K. F. Meyer (pp. 91–98) (see p. 276); Hog Cholera Control Investigations of the United States Department of Agriculture.—Report of Progress, by M. Dorset (pp. 99–112) (see p. 280); Uniform Methods for Control of Hog Cholera, by P. Fischer (pp. 112–118); Standardization of Antihog-Cholera Serum, by T. P. Haslam (pp. 118–123) (see p. 280); Methods of Manufacturing Antihog-Cholera Serum and Virus, by F. A. Bolser (pp. 123–127); The Refinement of Hog-Cholera Serum, by J. Reichel (pp. 127–138); Antihog-Cholera Serum Pro-

duction in Kentucky, by R. Graham (pp. 138–146); Trichinosis, by B. H. Ransom (pp. 147–165) (see p. 276); Suggestions Relative to the Control of Interstate Movements of Live Stock, by J. I. Gibson (pp. 166–174); Report of the Committee on Uniform Standards of the Eastern Live Stock Sanitary Association (pp. 174–185); The Spread of Disease Through Garbage, by V. A. Moore (pp. 185–188); The Glanders Question in Connecticut, by F. G. Atwood (pp. 189–207); Live Stock Importation Problems in the Philippines, by A. R. Ward, pp. 207–220); Infectious Anemia of the Horse, by H. Schmidt (pp. 220–225); Worthless Disinfection, A Serious Problem in Live Stock Sanitation, by J. T. A. Walker (pp. 225–231); etc.

[Report of veterinary work in California] (*California Sta. Rpt. 1915, pp. 36, 37, 38–43*).—Studies were made by Ledyard of the thread lung-worm (*Dictyocaulus filaria*) during an outbreak in Marin County in a recently purchased herd of 150 Angora goats. Embryos and ova of this nematode were kept alive in wet soil for three months. It occupies the bronchi and pockets in the nasal passages, death appearing to be caused through suffocation. Fumigants, tracheal injections, and anthelminthics were found to be valueless as remedial measures. It was found that mature worms do not survive vapors of chloroform for longer than 3.5 minutes under laboratory conditions, and an injection of 1.5 cc. of chloroform into each nostril proved successful in eliminating a number of the worms without any harmful effect on the host resulting. The outbreak was brought under control by means of chloroform, isolation, and sanitary measures.

During the course of lung-worm investigations the goats were found to be seriously infested by lice, which represent a new species, described by V. L. Kellogg as *Trichodectes hermsi*.

A practical application of a method of vaccination against chicken pox devised at the Wisconsin Station (E. S. R., 31, p. 887) was made by J. R. Beach. In a badly infected flock in which 1,177 fowls were treated only 9 per cent subsequently developed chicken pox lesions, whereas 87.5 per cent of 121 fowls in the same pen left unvaccinated subsequently developed the disease. Figures presented indicate that vaccination has a curative as well as a preventive value.

Experiments were made by J. Traum in massaging the injected area in the intradermal tuberculin test. It was found in 135 cattle tested that massaging in this way neither obviated nor decreased the reaction but increased it in 9 cases.

Five of 7 calves immunized in 1913 against tuberculosis after the method of Pearson and Gilliland, were killed, one showing tuberculous infection, one lesions the nature of which was not determined, and three no lesions. C. M. Haring concludes that the methods of von Behring and the modifications used by Pearson and Gilliland not only failed to protect sufficiently to be of practical value, but that the Pearson and Gilliland method with Culture Ravenel M is positively dangerous in that the vaccine may in some cases transmit bovine tuberculosis. In order to test the infectivity of a dairy barn, corral, and 30-acre pasture in which a tuberculous herd had been kept and where several open cases of the disease occurred, 25 nonreacting healthy animals were placed therein one month after removal of all infected animals, the manger, water troughs, etc., being left in the condition in which they were found. After an interval of 70 days the cattle were tested and none reacted, and 11 were killed for beef and no lesions could be found. The remaining animals were tested at the end of 6 and 12 months, respectively, but no reactors had developed.

Further data are given on stock diseases in the Imperial Valley (E. S. R., 26, p. 482). There is said to have been less hog cholera in the valley than during previous years. Dermatitis in horses, which occurs in the valley primarily during hot weather, is said to improve under proper grooming. Excellent results

have been obtained from the application of a preparation consisting of salicylic acid 4 oz., creolin 4 oz., liquid pitch 4 oz., sublimated sulphur 2 oz., and cottonseed oil 1 pint. The skin disease of pigs, known locally as smallpox, has been demonstrated by W. J. Taylor to be due to the presence of *Demodex folliculorum suis*. Dipping in a 2 per cent compound cresol solution with water greatly relieves the condition, destroying *Bacillus necrophorus* which infects the papules.

Report of the state veterinarian, C. KEANE (*Bien. Rpt. State Vet. Cal., 7 (1914), pp. 14*).—This report relates largely to work with infectious diseases, cattle tick eradication, scabies in sheep, etc., for the biennial period ended June 30, 1914.

Report of veterinary department, C. F. DAWSON, W. A. MUNSELL, and J. W. DEMILLY (*Ann. Rpt. Bd. Health Fla., 26 (1914), pp. 191–247*).—This report includes accounts of hog cholera and cattle tick eradication work.

The authors have found that "the virus of hog choera is digested in the intestinal tract of buzzards, and that the droppings of buzzards fed on the flesh of hogs dead from cholera do not produce cholera when mixed in the feed of hogs. . . . While the buzzard does not carry hog cholera in its droppings, it seems highly probable that the buzzard does carry the virus, not only of hog cholera, but of many other diseases as well, on its feet and feathers and in its vomitus."

It is thought that the disease of dogs known as black tongue may be due to the infestation of *Uncinaria canina* since all that were given the thymol-salts treatment recovered. Reference is made to the occurrence of Aujeszky's disease or mad itch (infectious bulbar paralysis) in mules in Florida.

Report of the veterinarian, J. B. PAIGE (*Massachusetts Sta. Rpt. 1914, pt. 1, pp. 67a, 68a*).—The diagnosis of bacillary white diarrhea of fowls by the agglutination test for *Bacterium pullorum* as previously described (E. S. R., 31, p. 683) met with considerable success and was made use of in eliminating carriers of the disease.

Veterinary notes, T. W. CAVE (*Jour. Southeast. Agr. Col. Wye, No. 22 (1913), pp. 533–557, pl. 1*).—These notes relate to prevention of white scour in calves, by T. W. Cave and W. H. Reid; blackhead in turkeys, by T. W. Cave; notes on the life histories of some nematodes parasitic in the alimentary canal of sheep, with suggestions for the treatment of the animals so infected, by H. E. Hornby; parasitic gastritis and enteritis of sheep, and bacillary necrosis of the liver, a disease of the unborn lamb, by T. W. Cave.

Annual report of the veterinary service for the year 1913, W. LITTLEWOOD (*Ann. Rpt. Vet. Serv. Egypt, 1913, pp. 27*).—This report deals largely with work with contagious diseases of animals and the work of the veterinary pathological laboratory.

Report on the civil veterinary department (including the Insein Veterinary School), Burma, for the year ended March 31, 1915, G. H. EVANS (*Ann. Rpt. Civ. Vet. Dept. Burma, 1915, pp. 7+15, pl. 1*).—This report includes accounts of veterinary instruction, the occurrence and treatment of contagious diseases, etc.

Applied immunology, B. A. THOMAS and R. H. IVY (*Philadelphia and London: J. B. Lippincott Co., 1915, pp. XV+359, pls. 26, figs. 45*).—The authors deal with the subject as related to the practical application of sera and bacterins prophylactically, diagnostically, and therapeutically. It has been their aim to omit most of the experimental research and to present theories only in so far as they may assist in a more thorough comprehension of the subject. In an appendix the serum treatment of hemorrhage, organotherapy, and chemotherapy are dealt with.

Investigations of the fixation of toxins by the leucocytes, KOBZARENKO (*Ann. Inst. Pasteur, 29 (1915), No. 4, pp. 190–211*).—A report of studies con-

ducted, together with a review of the literature, a list of 26 references to which is included.

The author finds that the leucocytes of the horse possess the property of neutralizing diphtheria toxin and that this capacity does not depend upon the physicochemical property of their protoplasm but upon their activity. The leucocytes of the horse are capable neither of absorbing nor of neutralizing the tetanus toxin. Only leucocytes of the rabbit which contain from 15 to 20 per cent of macrophages possess this property and their effect is not very pronounced. The leucocytes are the defenders of the organism in its fight against pathogenic agents and their toxins and determine the natural immunity against the latter.

Parasitism and Eosinophilia, D. E. PAULIAN (*Compt. Rend. Soc. Biol. [Paris], 78 (1915), No. 7, pp. 155, 156*).—The author finds that helminth toxins sensitize the organism and the anaphylaxis causes the eosinophils to appear, it being their part to defend the organisms against the toxins just as the polynuclears defend against the microbes.

The recognition of atypical forms of blackleg in the United States, K. F. MEYER (*Rpt. U. S. Live Stock Sanit. Assoc., 18 (1915), pp. 91–98*).—"Attention is called in this note to the occurrence in this country of 'atypical' blackleg. The term is used to specify that blackleg can occur in cattle without showing the lesions published in text-books and commonly emphasized to students and the laity. The pathologic-anatomical lesions (particularly in the internal organs, as liver and pleura) are far more multiform than suspected. It is essential that complete autopsies be made on all cattle; also, sporadic cases often offer valuable information and enable the sanitary officer to prevent further losses. The methods of diagnosis are cited and explained.

"The occurrence of blackleg affections in hogs in this country (in Pennsylvania) is reported. As a causative agent, the so-called Ghon-Sachs bacillus has been found. These results are confirmed by the work of Koves in Hungary."

Contributions to the serodiagnosis of glanders; the technique of the K. H. reaction in diagnosing glanders, W. PFEILER and F. SCHEFFLER (*Berlin. Tierärztl. Wchnschr., 31 (1915), No. 11, pp. 121–124*).—The K. H. (conglutination-hemolysis) reaction of Pfeiler and Scheyer is a reaction in which there is hemagglutination and deviation of complement at the same time. If conditions are unfavorable for complement fixation, hemolysis occurs.

In a study of over 5,000 sera, some were found which did not give the agglutination, complement fixation, or conglutination reactions, but which gave the K. H. reaction. The K. H. test seems to be adapted to the diagnosis of chronic cases of glanders. Cases were found which did not give the K. H. reaction, but gave results with the complement fixation method.

Trichinosis, B. H. RANSOM (*Rpt. U. S. Live Stock Sanit. Assoc., 18 (1915), pp. 147–165*).—Following accounts of the parasite *Trichinella spiralis* and the disease caused by it, the author discusses sources of infection, prevalence of trichinæ in hogs, effects of heat, low temperatures, and salt upon trichinæ, and prophylaxis.

Experiments in the "tryposafrol" treatment of trypanosomiasis (Trypanosoma brucei) in guinea pigs and of piroplasmosis in dogs, G. H. F. NUTTALL and E. HINDLE (*Parasitology, 8 (1915), No. 2, pp. 218–228*).—In tests here reported both tryposafrol and novo-tryposafrol exerted a directly injurious effect upon guinea pigs infected with *T. brucei*. Four dogs infected with *Piroplasma canis* died, although treatment with novo-tryposafrol was given under the most favorable conditions, starting on the date of inoculation. "The drug exerted no influence upon the course of the disease nor upon the appearance

of the parasites and their progressive increase in the blood. Novo-tryposafrol may therefore be regarded as useless in the treatment of canine piroplasmosis and, judged from these results on dogs, it will no doubt prove to be equally useless in the treatment of bovine piroplasmosis when it has received a scientific trial in competent hands.

"In view of the negative results obtained by ourselves and other independent investigators, working especially with trypanosomiasis, we conclude that the value of tryposafrol or novo-tryposafrol as a remedy for any of the diseases enumerated by the authors is open to grave doubt, since the chief claims as to its efficacy were based on experimental results which the authors state that they obtained with nagana."

A list of nine references relating to tryposafrol is appended.

The tubercle bacilli content of the musculature, the blood, and the lymph of apparently nontuberculous animals, M. Müller and T. Ishiwara (*Centbl. Bakt.* [*etc.*], *1. Abt., Orig., 74 (1914), No. 5–6, pp. 393–455, fig. 1*).—The authors report that the dissemination of tuberculous infection in the animal's body takes place chiefly by the lymphogenous route. Tubercle bacilli are not as a rule demonstrable in the blood stream of animals affected with generalized tuberculosis, nor are they always noted in tuberculous broncho-pneumonia with foci. A tuberculous infection of the intermuscular lymph nodes does not indicate an infection of the blood. When tubercle bacilli are present in the blood or in the intermuscular lymph nodes the musculature is almost always free from them. The tuberculous infection of the intermuscular lymph nodes occurs as a rule in either a purely lymphogenous or hematogenous manner through the agency of the nourishing blood vessel. The infection of the various organs of the animal body which do not communicate directly with the outside is not necessarily brought about by way of the blood stream. Some heavily tuberculous animals harbor latent tubercle bacilli in the spleen, liver, and intermuscular lymph nodes.

Danish investigations showing how tubercular fowls infect pigs, J. J. Dunne (*Trans. in Jour. Bd. Agr.* [*London*], *22 (1915), No. 1, pp. 41–45*).—Investigations having shown that pigs may be infected with avian tuberculosis, examinations were made, at the Danish State Laboratory, of tuberculous mesenteries and tonsils taken at abattoirs of several swine-slaughtering companies.

Examinations of the diseased organs of 118 tubercular pigs showed 86 of them to contain bacteria identical in every respect with avian tubercular bacteria, and 28 to contain tubercular bacteria of the bovine type. In the remaining 4 cases the bacteria deviated in form from both types, but in two cases closely resembled the avian type.

"The results of the foregoing examinations show that the character of the disease varies in accordance with the type of tubercular bacteria by which the pig is attacked. An attack of avian tubercular bacteria is usually of a local character, while that of bovine tubercular bacteria is of a general character. . . . On the whole the results of the investigations show that the overwhelming majority of the cases of mesenteric tuberculosis are of a local character and almost exclusively due to avian tubercular bacteria."

Examinations of swine on five farms at Remkolde with a total of 163 pigs, where bovine tuberculosis no longer exists but where the poultry was tubercular, gave 6, 17, 18, 21, and 36 per cent, respectively, of tubercular animals.

In two cases where the existence of avian tuberculosis amongst the swine was detected the owners disinfected the sties and the hen roosts and carefully isolated the animals. The swine reared under the new conditions were found to be entirely free from the disease, although prior to taking these precautions two or more animals in every lot were found to be affected. "It appears, therefore,

that the infection of pigs with avian tuberculosis can be prevented most effectively by isolating the pigs and the poultry and taking drastic measures for the eradication of the disease amongst the latter."

Observations upon the tuberculin test as applied to bovine animals, F. C. MASON (*Dept. Agr. and Tech. Instr. Ireland Jour., 15 (1915), No. 2, pp. 318–331*).—This report presents temperature charts which record the results of experiments with 300 reacting cows. The conclusions arrived at have been summarized by the author as follows:

"It has been proved beyond doubt that an injection of tuberculin will confer upon a tuberculous animal the power of resistance to a second injection for a certain period. If the amount of the first injection be increased, no increase in length of the period of resistance to a second injection occurs. This acquired power of resistance to the action of tuberculin was found to be retained for one week in 100 per cent of cases, two weeks in 50 per cent of cases, and three weeks in 33 per cent of cases. In no case did it continue for four weeks.

"If in testing animals which had previously received an injection of tuberculin a double dose be employed, then a reaction will be obtained between the third and sixth hours in at least 45 per cent of cases. Repeated injections of tuberculin at intervals of 14 days or 21 days gradually increases the number of animals in the groups which will resist a further injection. It has been found that if a group of animals be injected with a dose of tuberculin every 14 days until four doses have been given, then on the fifth injection no reaction follows in any of the animals. A longer period is required to obtain the same results if the doses be separated by three weekly intervals.

"The ophthalmic and intradermal methods of testing have proved entirely satisfactory in our hands. Easily demonstrable reactions have been obtained in animals previously or simultaneously subjected to subcutaneous injection of tuberculin, also in animals tested by the ophthalmic and intradermal methods one week previously."

Failure of tuberculin to cause reaction in tubercular cattle, H. K. BERRY (*Vet. Alumni Quart.* [*Ohio State Univ.*], *3 (1915), No. 2, pp. 50–54*).—A table is given of the temperatures and post-mortem findings of 178 cattle which gave no reaction to the tuberculin test but were found to have tubercular lesions.

The production and detection of specific ferments for the typhoid-coli group, G. H. SMITH (*Science, n. ser., 42 (1915), No. 1080, pp. 354, 355*).—Experiments reported indicate that previous treatment of the bacteria with immune serum renders them more susceptible to assimilation by the body and thus enables them to bring about a more rapid formation of the specific ferments which may be detected by the Abderhalden test.

Diseases and treatment of the horse, cow, and hog, W. U. GORDON (*Winamac, Ind.: Loehrke & Gordon, 1914, pp. V+144*).—A popular work.

Investigation of live stock conditions and losses in the Selby smoke zone, C. M. HARING and K. F. MEYER (*U. S. Dept. Int., Invest. Live Stock Conditions and Losses in Selby Smoke Zone, 1915, pp. 474–502, pls. 3*).—"It appears probable that in the past considerable damage to horses has occurred in the smoke zone from lead emanating from the Selby smelter. The effects of this previous injury are still evidenced by a number of long-standing cases of roaring in horses. The clinical symptoms of roaring in these horses are due to partial paralysis of those muscles of the larynx supplied by the recurrent laryngeal nerves. This paralysis is probably due to the ingestion of lead. In some cases aspiration pneumonia, on account of the paralysis of the pneumogastric nerve, had developed.

"The value of the animals affected is reduced 50 to 90 per cent, according to the severity of the paralysis. In two cases fatal results have been brought on

through the inhalation of food particles, which results in gangrenous pneumonia (so-called 'Vagus pneumonia'). To date (July 19, 1914), we have not been able to find any evidence of injury since March, 1914. There is no evidence or suspicion that the smelter smoke has ever injured cattle or hogs. It is claimed by certain owners that sheep have been injured, but we have been unable to procure any clinical evidence to substantiate such assertions.

"Until additional evidence can be found, there is no reason to believe that the Selby smelter smoke is doing any damage to live stock at present (since March, 1914)."

Corrosive sublimate poisoning stock, R. W. Darner (*North Dakota Sta. Spec. Bul., 3 (1915), No. 21, pp. 353, 354*).—Statements have been made that in some instances stock have been poisoned from drinking water which had stood in galvanized troughs previously used for treating wheat for smut with corrosive sublimate. On immersing a galvanized iron plate in a 3 per cent solution of corrosive sublimate it was found that the solution lost in strength about 1 per cent in 1.5 hours, while the plate had corroded and lost 5.14 per cent in weight. Plates thus treated were placed in well water for about 3 weeks. The plate was found to be rusted and had lost 0.73 per cent in weight. Untreated plates were found not to be rusted. The water was found to give tests for mercury salts.

Effect of cotton-seed meal feeding on the regenerative organs of the cow, W. A. Barnett (*Vet. Alumni Quart.* [*Ohio State Univ.*], *3 (1915), No. 2, pp. 73, 74*).—In an effort to reduce the number of abortions and retained afterbirths in a certain farm herd in which negative complement fixation and agglutination tests had been obtained, the feeding of cotton-seed meal was discontinued for seven weeks before calving, a bulky food with a small quantity of concentrates being substituted. In cases where this was tried the percentage of retentions of afterbirth was reduced.

With the remaining pregnant cows a balanced ration containing a very small quantity of cotton seed was used. Notwithstanding these precautions the number of abortions was not diminished although less retention of afterbirth occurred. Once the toxic substance contained in the meal is taken up by the system its elimination is apparently difficult; at least it is little influenced by change in feed alone. Epsom salts seemed to assist in preventing retention of afterbirth.

"The constant feeding of cotton-seed meal and hulls has been observed to produce abortion and retention in various parts of South Carolina. Failure to conceive when bred is a common sequela. This seemed to be due in many cases to a closing over of the os uteri by adhesions; breaking down the adhesions seldom removed the sterility, however."

The bacterial flora of the buccal cavity of healthy hogs with special reference to auto-infection in hog cholera and swine plague, A. van der Laan (*Centbl. Bakt.* [*etc.*], *1. Abt., Orig., 74 (1914), No. 7, pp. 547–579*).—The object of this investigation was to determine the bacteria which occur in the mouths of healthy hogs. All pigs examined were young animals 6, 7, and 8 weeks old.

From the buccal membrane of every pig *Bacillus coli* strains and gram-positive cocci were isolated. From two hogs *B. proteus* was obtained. Ovoid bacilli were found in the buccal mucosa of three pigs, bacilli of the paratyphoid B group twice, and a number of nonpathogenic saprophytes. From the mouths of two hogs organisms having the cultural characteristics of *B. voldagsen* and *B. typhi suis* (Glässer) were isolated, but they did not, however, behave the same serologically and pathologically. Erysipelas bacteria and the tubercle bacilli were not found.

The ovoid bacilli residing saprophytically in the mouths of healthy hogs could not be distinguished morphologically or culturally from *B. suisepticus.*

Among the ovoid bacilli there were virulent strains, the virulency of which could be increased by passage through animals, and the strains could produce in pigs a condition typical of swine plague. With the complement fixation test the saprophytic ovoid bacilli were proved to be identical with the bacillus of swine plague, and probably all of the nonpathogenic strains of ovoid bacilli can under certain circumstances become pathogenic and cause auto-infection. The author agrees with Glässer, Dammann, Stedefeder, Pfeiler, and Kohlstock that the diseases coming under the caption of hog cholera are not all caused by the same virus, one being caused by the filterable virus and the other by *B. typhi suis*. The latter is in no way identical with *B. suipestifer*.

A list of 35 references is appended.

The relation of parasites to hog cholera, J. W. Connaway (*Breeder's Gaz., 68 (1915), No. 17, pp. 718, 720*).—A description is given of the more common endoparasites of hogs, namely, the common round worm (*Ascaris suis*), thorn headed worm (*Echinorhynchus gigas*), lung worm (*Strongylus paradoxus*), and kidney worm (*Stephanurus dentatus*). They are deemed a source of irritation and inflammatory conditions, thus increasing the susceptibility to hog cholera.

Hog-cholera control investigations of the United States Department of Agriculture.—Report of progress, M. Dorset (*Rpt. U. S. Live Stock Sanit. Assoc., 18 (1915), pp. 99–112, figs. 3*).—A report upon the progress of the work being carried on by this Department.

Standardization of antihog-cholera serum, T. P. Haslam (*Rpt. U. S. Live Stock Sanit. Assoc., 18 (1915), pp. 118–123*).—An account of work in the standardization of serum carried on at the Kansas College serum plant.

Proceedings of the meetings of committee on federal ante-mortem inspection, National Live Stock Exchange (*St. Joseph, Mo.: McDonald Printing Co. [1914], pp. 30*).—This is a report of the committees on ante-mortem hog inspection.

The dog as a carrier of parasites and disease, M. C. Hall (*U. S. Dept. Agr. Bul. 260 (1915), pp. 27, pls. 14*).—A summarized account of the subject, in which the author calls attention to the increasing damage done by the stray and uncared for dog as a carrier of parasites and disease germs harmful to both man and live stock.

The cause of pernicious anemia of the horse, R. Seyderhelm (*Verhandl. Deut. Path. Gesell., 1914, pp. 456–460*).—This address, based upon investigations previously noted (E. S. R., 33, p. 681), is discussed by Joest, Schridde, and Huguenin.

Preliminary report on the recognition of swamp fever or infectious anemia in New York State, D. H. Udall and C. P. Fitch (*Cornell Vet., 5 (1915), No. 2, pp. 69–80, pls. 6*).—The authors here report upon an outbreak of swamp fever that extended over an area 25 miles square, located in the northern part of St. Lawrence and Franklin counties, N. Y., and having for its northern boundary the St. Lawrence River. A considerable portion of the infected region is included in the St. Regis Indian Reservation, and the owners of many of the animals were Indians. The author has been unable to find any previous account of its occurrence in the eastern United States.

Some spirochetes found in papillomatous neoplasma in horses, M. Carpano (*Centbl. Bakt.* [*etc.*], *1. Abt., Orig., 74 (1914), No. 7, pp. 584–591, pl. 1, figs. 18*).—The author describes an affection of the mucous membrane of the horse that is characterized by papillomatous neoplasma containing spirochete forms. Clinically the lesions resemble those found in glanders.

Poultry diseases, their symptoms, prevention, and cure, E. J. Butzke, C. T. Patterson, and T. E. Quisenberry (*Mountain Grove, Mo.: Amer. School Poultry Husbandry, 1914, pp. 93, figs. 30*).—A popular account.

Anatomical and histological studies on some new species of avian cestodes, HÉLÈNE BACZYŃSKA (*Bul. Soc. Neuchâtel. Sci. Nat., 40 (1914), pp. 187–239, figs. 73*).—Fifteen new species are here dealt with of which two, namely, *Davainea penetrans* and *D. cohni,* were taken from the domestic fowl (*Gallus domesticus*) in West Africa.

RURAL ENGINEERING.

Experiments in the use of current meters in irrigation canals, S. T. HARDING (*U. S. Dept. Agr., Jour. Agr. Research, 5 (1915), No. 6, pp. 217–232*).—In connection with experimental work by Scobey previously noted (E. S. R., 33, p. 183) comparisons of various methods of current-meter gaging of irrigation canals were made with measurements in which the velocities at from 70 to 120 points were taken. Canals of various types of cross section having discharges varying from 2 to 2,600 second-feet and velocities of from 0.5 to 8 ft. per second were included.

"In 96 measurements the 0.2 and 0.8 depth, or two-point method gave results averaging 0.73 per cent too high, and the 0.6 depth, or single-point method gave results 4.8 per cent too high. The average variation for a single measurement was 1.5 per cent for the two-point method. If the results for the single-point method are corrected by —5 per cent, the average variation of a single observation is 2.5 per cent.

"In 55 measurements the vertical integration method gave results averaging 0.76 per cent too high, and an average variation for a single observation of 2.07 per cent. The use of three-point methods gave errors greater than the two-point method alone.

"There were no marked variations of the accuracy of any of these three methods due to difference in velocity, depth, or value of *n* in Kutter's formula.

"In 92 measurements to determine the coefficient to be used to reduce the maximum surface velocity as measured by small floats to the mean for the entire cross section the coefficient was found to vary with the value of *n* in Kutter's formula and the size of the canal. For water cross sections of over about 35 sq. ft. the coefficient remains constant for any given value of *n*. . . . The coefficient varies from 0.6 to 0.91 for different conditions. The average variation of the coefficient for a single observation from the mean values was about 6 per cent, and in one-fifth of the observations exceeded 10 per cent.

"In 89 experiments on the use of observations of varying numbers of verticals across the width of canals, it appears that in uniform cross sections, such as flumes or lined canals, observations in 8 verticals gave an average within 1 per cent and in 4 verticals within 3 per cent of the discharge obtained within 16 verticals. In earth canals observations in 8 verticals give an average within 3 per cent and 4 verticals within about 9 per cent. For equivalent accuracy about twice as many verticals should be observed in ordinary earth sections as in uniform lined sections.

"It was found that the use of only 2 verticals located from one-fifth to one-sixth of the width of the water surface from the sides of the section in canals with vertical sides such as flumes, gave results within an average of 2.5 per cent. In concrete-lined sections with sloping sides similar results were obtained where the velocities were measured at from one-fifth to one-fourth of the width from the sides, and the areas were secured from the known cross sections.

"In earth canals 2 points from one-fifth to one-fourth of the width of the water surface from the sides give velocities varying from the mean of the whole cross section by about 6 per cent. Where the depths at these two points

are used to give the average depth, the total discharge is determined with an average error of about 6 per cent. Errors in individual experiments were much higher."

See also a previous note by Scobey (E. S. R., 31, p. 288).

[Irrigation investigations in California] (*California Sta. Rpt. 1915, pp. 14–17*).—Irrigation investigations made in cooperation with the Office of Experiment Stations of the U. S. Department of Agriculture and with the California State Department of Engineering under the direction of F. Adams are reported. Experiments on the economical use of irrigation water by F. Adams and R. D. Robertson on about 70 Sacramento Valley farms showed that "on the average the same rule of diminishing yield and diminishing profits, where more than 30 acre-inches of irrigation water have been applied to alfalfa, holds equally on those farms, although, of course, the economical duty of water for alfalfa on very open and very tight clay soils differs considerably. The depth applied annually on the 70 farms has varied from 1.04 to 9.59 ft. On one farm, where the application was 9.59 acre-feet per acre, the yield of alfalfa was only 5.84 tons per acre and on another, where the application was 1.04 acre-feet, the yield was 7.17 tons per acre. In the former case the soil was underlaid with coarse gravel, whereas in the latter case it was a silt loam."

Duty-of-water studies on alfalfa soils by F. Adams, S. H. Beckett, and O. W. Israelsen, during which more than 18,000 soil-moisture determinations were made, showed that in one case "the amount of water applied at each irrigation was nearly five times the calculated water capacity of the first 6 ft. of soil and nearly five times the quantity retained." In another case desirable practice was illustrated in that "the calculated water capacity, the quantity applied, and the quantity retained were very nearly equal." On most hard soils studied "it was impossible to get into the soil more than about one-third of the amount the first 6 ft. could absorb. . . .

"It is obvious from these results that it is not economical to apply 2 acre-feet of water at an irrigation when 0.5 acre-foot is all the upper 6 ft. of soil will retain. It is equally obvious that a type of practice that fails to put irrigation water into the soil where the crop can utilize it is faulty."

Irrigation of rice on the coastal prairies of Texas, C. G. Haskell (*Texas Dept. Agr. Bul. 43, pp. 88–116, figs. 3*).—This paper deals with the methods developed for the irrigation of rice in southeast Texas.

The soils of the locality consist of sandy loam, loam, and heavy black clay, with an impervious subsoil near the surface, and are considered to be well suited for rice growing. A good supply of fresh water is considered essential for rice irrigation, and 99.8 per cent of the water used is pumped. The pumping machinery generally is designed to provide 1 cu. ft. of water per minute per acre of land irrigated, the lift varying from 10 to 80 ft. Fourteen years' study of the duty of water for rice irrigation indicated that, allowing time for a breakdown of the pumping plant and for the stopping of pumping during or after rains, the duty of water for rice irrigation for prairie land irrigated from canals varies from 7.5 to 8 gal. per minute per acre, depending upon the character of the land and the distance the water is conveyed. For the black clay loam or loam alluvial soils along the rivers 10 gal. of water per minute per acre is considered necessary, while land with a loose subsoil near a river or lake may require 38 to 40 gal. per minute per acre. Petroleum has been found to be the best fuel for pumping plants within short distances of the oil fields.

The irrigation canals are built on the highest ground and consist of two parallel levees built on the surface of the ground 50 to 200 ft. apart with laterals or smaller canals branching from the main canals to reach land on

all sides. Further general information is given regarding the building of canal embankments, the distribution of water from canals, and for drilling and casing wells. The vertical centrifugal pump has been found to give the best satisfaction in all respects and is said to be almost universally used.

Experiments conducted to determine the effect of water containing different percentages of sea salts on growing rice are also reported, the percentages of salt in the water varying from 0.05 to 1 per cent. It was found that water with more than 0.3 per cent of salt when applied every two weeks after the rice had stooled in fresh water killed the rice. Rice irrigated with water containing 0.2 and 0.3 per cent of salt made only short heads and small grains. When salt water was applied only once and fresh water was applied at the next irrigation the injury was not so great as when the rice was irrigated with salt water several times, and when salt water and fresh water were applied alternately every two weeks during the season the rice was not injured quite so much as when only salt water was applied.

"Two-tenths per cent or more of salt in the irrigation water will cause some of the leaves and hulls of the rice plants to turn brown. The more salt there is in the water beyond a certain percentage the greater is the injury; 0.15 or 0.1 per cent of salt in water will cause the rice to grow better than 0.05 per cent, which shows that these small amounts of sea salt act as fertilizers. Larger percentages of salt can be used if there is rain or if there is considerable fresh water on the field to dilute the salt water."

Further general information is given regarding the preparation of a rice field for irrigation, including particularly the application of water, the location and building of levees, and the value of irrigation as a means of controlling insects and rice plant diseases.

Drainage and reclamation (*California Sta. Rpt. 1915, p. 18*).—Experiments on drainage of alkali soils made in cooperation with the Office of Experiment Stations of the U. S. Department of Agriculture are reported.

Four miles of 10- and 12-in. tile drains with 6-in. laterals laid at a depth of a little less than 6 ft. in a quarter-section of vineyard soil rendered unproductive by alkali were found to remove approximately 97,580,000 gal. of drainage water the first season, containing 151.5 tons of alkali, mostly common salt. "Extensive tests of the soil show a very decided decrease in common salt but no material change in the black alkali. A rather unsatisfactory crop of Egyptian corn was grown on the east half of the area. After one season's flooding the alkali weed, which was so abundant, has almost wholly disappeared and Bermuda grass is so rapidly taking its place as to become an important factor in the cost of reclamation. The cost of the drainage system, including pump and motor, was somewhat less than $70 per acre, while leveling the land and operating expenses, including pumping, have cost during the year $15 per acre additional."

Land drainage by means of pumps, S. M. Woodward, revised by C. W. Okey (*U. S. Dept. Agr. Bul. 304* (*1915*), *pp. 59, pls. 8, figs. 3*).—This bulletin represents the results of a revision of the bulletin previously noted (E. S. R., 26, p. 589) with special reference to the upper Mississippi Valley.

It is stated that a pumping plant should have a capacity sufficient to remove as a minimum amount in 24 hours a quantity of water sufficient to cover the entire district to a depth of 0.3 in. "Since it has been shown that the average depth of water to be pumped from such districts per year will be about 15 in., with well-designed and carefully operated plants the total cost per acre of drainage area per year should not exceed 80 cts. for a mean lift of 5 ft. and $1.20 for a mean lift of 10 ft. The administration of the business of the district should be placed in the hands of a competent engineer who is familiar with

drainage work. . . . Full records of the operation of the pumping plant should be kept, as well as detailed classification of expenditures. . . . Where practicable, gravity outlet sluiceways should be installed in connection with a pumping plant for use during times of low water outside of the drainage district."

Water resources of Hawaii, 1913, G. K. LARRISON (*U. S. Geol. Survey, Water-Supply Paper 373 (1915), pp. 190*).—This report, prepared in cooperation with the Territory of Hawaii, presents the results of measurements of flow made on certain streams and ditches, and rainfall records of four of the larger islands of Hawaii for 1913.

Surface water supply of Hudson Bay basins and upper Mississippi River for the year ended September 30, 1913 (*U. S. Geol. Survey, Water-Supply Paper 355 (1915), pp. 181, pls. 2*).—This report, prepared in cooperation with the States of Iowa and Minnesota, presents the results of measurements of flow made on streams in the Hudson Bay and upper Mississippi River drainage basins.

Surface water supply of Oregon, 1878–1910, F. F. HENSHAW and H. J. DEAN (*U. S. Geol. Survey, Water-Supply Paper 370 (1915), pp. VII+829, pl. 1*).—This report, prepared in cooperation with the State of Oregon, describes the topography, climate, and hydrography of Oregon and gives the results of measurements of flow made on streams in the State from 1878 to 1910.

Profile surveys in 1914 on Middle Fork of Willamette River and White River, Oregon (*U. S. Geol. Survey, Water-Supply Paper 378 (1915), pp. 8, pls. 6*).—This report, prepared in cooperation with the State of Oregon under the direction of R. B. Marshall, describes the general features of the Willamette and White River basins and gives plans and profiles resulting from plane table and stadia surveys in the basins in 1914.

Profile surveys in Spokane River basin, Washington, and John Day River basin, Oregon (*U. S. Geol. Survey, Water-Supply Paper 377 (1915), pp. 7, pls. 10*).—This report, prepared under the direction of R. B. Marshall, describes the general features of the Spokane and John Day River basins and gives plans and profiles resulting from plane table and stadia surveys made in the basin.

The water resources of Texas and their utilization, W. L. ROCKWELL (*Texas Dept. Agr. Bul. 43, pp. 7–87, figs. 38*).—This paper reports a preliminary investigation of the water resources of the State available and adaptable for irrigaton; the extent, nature, and location of lands susceptible of and suitable for irrigation; methods and equipment used in the application of irrigaton water, including the weir, submerged orifice, and rating flume; and in a general way better cultural methods for different crops to be employed under varied soil and climatic conditions.

Desert wells (*U. S. Dept. Int., Off. Indian Aff. [Pub.], 1915, pp. 8, fig. 1*).—This pamphlet reports the progress made in obtaining deep-well water supplies for domestic and irrigation use on the Navajo and Hopi Indian reservations in Arizona and New Mexico by the Bureau of Indian Affairs of the Department of the Interior. In a number of cases sufficient water has been obtained for domestic use, but rarely enough for irrigation.

Report of the second interstate conference on artesian water, Brisbane, 1914 (*Rpt. Interstate Conf. Artesian Water [Aust.], 2 (1914), pp. XX+295, pls. 36, fig. 1*).—The proceedings of this conference are given.

Studies on the culture media employed for the bacteriological examination of water, I, E. M. CHAMOT and H. W. REDFIELD (*Jour. Amer. Chem. Soc., 37 (1915), No. 6, pp. 1606–1630, fig. 1*).—Experiments with the Schardinger-Dunham medium for testing for the presence of hydrogen sulphid-forming or so-called putrefactive bacteria in water are reported, the purpose of which was to obtain a medium which would yield positive uniform results in the shortest

time. The method tested consisted of adding a peptone and salt solution to the water and observing the effect on a strip of paper impregnated with lead carbonate and suspended over the mixture after incubating at 37° C. for 24 hours.

It was found that irrespective of the inorganic salts present and of the acidity of the medium a concentration of between 3 and 4 per cent of peptone in the final inoculated and incubated medium appeared to favor the most rapid and energetic production of hydrogen sulphid. The addition of beef broth to simple peptone media slightly increased its sensitiveness, but not in proportion to the increased trouble and labor involved. "If sodium chlorid is used, the quantity added must not be over 1.5 per cent." Cultures to which this salt was added showed greater hydrogen sulphid production than those which contained none. In 3 per cent peptone media, the presence of from 0.5 to 1 per per cent of potassium chlorid had a decidedly beneficial influence and led to quicker. better, and far more uniform results than any other inorganic salt tried.

"Positive results of hydrogen sulphid formation may be obtained in 18 hours. No hydrogen sulphid formation is obtainable in as long a period as 72 hours from natural waters which are truly 'clean,' while much is formed in from 12 to 24 hours with contaminated waters. The feces of domestic animals contain bacteria which are capable of producing hydrogen sulphid from a simple peptone medium in as large amounts as is the case of the bacteria from human feces. The large amounts of hydrogen sulphid rapidly produced by organisms of sewage appears to be not due primarily to members of the *Bacillus coli* group. This group of hydrogen sulphid-producing bacteria does not actively ferment carbohydrates. Hence testing for their presence is a valuable aid supplementing tests for gas producers and is of especial value in polluted waters in which the *B. coli* group is absent. Some evidence has been obtained which apparently indicates that hydrogen sulphid is more rapidly produced in waters containing a mixed bacterial flora than by the isolated pure cultures alone."

Studies on the culture media employed for the bacteriological examination of water, II, E. M. CHAMOT and C. M. SHERWOOD (*Jour. Amer. Chem. Soc., 37 (1915), No. 8, pp. 1949–1959, figs. 4*).—In continuation of the experiments noted above tests were made of the lactose-peptone media.

The results showed that "in the fermentation of lactose by bacteria in water contaminated by sewage, human feces, the feces of domestic animals, and pure strains of the *Bacillus coli* group, the total volume of gas formed increases to a final maximum with the concentration of the peptone, meat, liver, or meat extract employed. The composition of the gas formed is dependent upon the concentration of the nitrogen-containing substance employed.

"The addition of from 0.5 to 1 per cent of potassium chlorid to lactose-peptone media appears to stimulate fermentation and assure more uniform results. Similar beneficial effects are obtainable with sodium chlorid, but of not so marked a character. Nothing is to be gained by employing a lactose concentration of over 1 per cent. Neutral media appear to yield slightly greater gas volumes than media slightly acid to phenolphthalein, but media having a reaction of approximately + 1 per cent ferment considerably more rapidly and yield diagnostic results in several hours' shorter time.

"The gas ratios of organisms of the *B. coli* group are dependent upon the concentration of the peptone or other similar nitrogenous material in the media. The addition of meat infusion to peptone media improves this media when low concentrations of peptone are employed, but yields media whose re-

actions rapidly change. A very sensitive peptone culture medium yielding uniform results and large gas volumes consists of peptone 3 to 4 per cent, lactose 0.8 per cent, potassium chlorid 0.6 per cent, reaction + 1 per cent. Such media show little change on keeping."

Studies on the culture media employed for the bacteriological examination of water, III, E. M. Chamot, C. M. Sherwood, and R. C. Lowary (*Jour. Amer. Chem. Soc., 37 (1915), No. 9, pp. 2198–2204, figs. 2*).—In the third paper of this series studies were made to determine the composition of the gases formed in the fermentation of the lactose-peptone media noted in the above paper.

It was found that "the percentage of carbon dioxid present in these gases increases with an increase in peptone, meat, or liver until an equivalent of approximately 4 per cent peptone is reached, after which it remains substantially constant. Hydrogen decreases with a rise in peptone until 4 to 5 per cent of peptone is reached, after which the percentage of this gas remains substantially constant. The 'gas ratio' varies with the concentration of the nitrogenous material present in the medium. No methane appears to be formed unless oxygen (air) has free access to the media and the inoculated medium stands for over 24 hours. A small but nearly constant amount of nitrogen is found in the gases of fermentation. An excess of oxygen retards gas formation and tends to increase the percentage of carbon dioxid."

The sterilization of water with lime, C. Haller (*Städtisch. Tiefbaw., 4, pp. 299–303; abs. in Chem. Zentbl., 1914, I, No. 2, p. 193; Chem. Abs., 8 (1914), No. 12, p. 2206*).—The disinfection of water when calcium oxid in sufficient quantity to combine with the free and half-bound carbon dioxid and magnesium is added is said to be not due to the toxic effect of calcium oxid. Bacteria of the typhoid and coli groups die in 48 hours owing to the fact that intestinal bacteria can not live in water from which the free and half-bound carbon dioxid have been removed. Water which has been treated with calcium oxid is said to be soon safe for use even if it had been previously polluted with *Bacillus typhosus* or sewage.

Farm water supplies (*Minneapolis, Minn.: Bd. Health, 1915, pp. 29, figs. 15*).—This paper deals mainly with the sanitary side of farm water supplies. It points out in a comprehensive manner the dangers lying in a polluted water supply and describes and illustrates bad well, spring, and cistern conditions and remedies for the same.

It is pointed out that in the movement of water through the soil natural purification takes place. "If a sufficient layer of soil exists between the surface and the supply, complete purification will occur. The amount of intervening soil necessary for this purpose depends upon the nature of its composition. Under ordinary conditions, as found to exist in Minnesota, 10 vertical feet of soil will be sufficient, provided the well itself is properly located and constructed. It is a common belief that pollution may seep through the soil for long distances and gain entrance into the well in this way, but such an idea is not universally true, and, as a matter of fact, the danger of surface wash getting into a well in this manner is very slight, and in most localities in Minnesota can be ignored as a source of danger."

Special attention is also drawn to the dangers of priming wells and in the use of deep-dug wells for the deposition of sewage.

Clean water and how to get it on the farm, R. W. Trullinger (*Nat. Food Mag., 39 (1915), No. 3, pp. 193–200, figs. 8*).—The substance of this article has been noted from another source (E. S. R., 33, p. 289).

Water supply, plumbing, and sewage disposal for country homes, R. W. Trullinger (*Dom. Engin.* [*Chicago Ed.*], *72 (1915), Nos. 7, pp. 194–197, figs.*

8; 8, pp. 224–226, figs. 7; 9, pp. 254–256, figs. 6; 10, pp. 284–286, figs. 4; 11, pp. 313–315, figs. 5; 12, pp. 338–340, figs. 8).—The substance of this article has been previously noted from another source (E. S. R., 30, p. 690).

Drainability of Emscher tank sludge, W. L. STEVENSON (*Municipal Jour., 39* (*1915*), *No. 12, pp. 427, 428, figs. 2*).—The author states that the essential properties of sludge disposed of on land are odor, volume, and drainability and reports the results of experiments to determine a simple test for the last. Composite samples of each batch of sludge placed on the drying beds of a sewage-disposal works were submitted to the two following procedures:

A portion amounting to 700 cc. is placed in a 1,000-cc. measuring cylinder, and the amount of clear water separated at the bottom is observed and recorded at hourly intervals. This is continued until the sludge begins to settle down into the water again. Another 700-cc. portion is placed in a vertical piece of glass tubing of the same internal diameter as the measuring cylinder. Over the lower end of the tube is secured a piece of wire screen which supports a ½-in. layer of small pebbles, a ½-in. layer of clean Jersey gravel, and a 2-in. layer of fine sand. The tube is held in a retort stand over a funnel resting in a measuring cylinder to collect the water draining out of the sludge, and the accumulated amount of water is read at hourly intervals until the sludge ceases to drain. The results are graphically reported, together with the usual analysis.

The results indicate that the factors which should be combined to represent the drainability of a sludge are (1) the rate of drainage, represented by the slope of the first part of the curve, (2) the ratio between the amount of water drained from a liter of sludge and the amount of moisture therein as determined by the usual evaporation method, and (3) the time required for the water to begin to drain out. Good sludge will be indicated by (1) having a steep slope, (2) showing a large number for the ratio, and (3) showing a short time; poor sludge the reverse.

Third international road congress (*Internat. Assoc. Road Cong., III. Cong.* [*London*], *1913, Rpts., pp. 3335, pls. 56, figs. 373*).—The proceedings of this congress are reported in detail and consist mainly of 123 reports on various phases of road design, construction, maintenance, cost, and administration, and on laboratory work related thereto.

Gas, gasoline, and oil engines, G. D. HISCOX, revised by V. W. PAGÉ (*New York: The Norman W. Henley Publishing Co., 1914, 21. ed., rev. and enl., pp. 640, pls. 2, figs. 433*).—In this, the twenty-first edition of this book, it has been attempted to include striking examples of all recent developments in the field of internal combustion engineering. The design, construction, and operation of all forms of gas, gasoline, kerosene, and crude oil engines, including particularly farm and gas tractor motors, are dealt with.

The book contains chapters on the subjects usually discussed in such a treatise, including the following of particular agricultural engineering interest: Cylinder capacity of stationary gas and gasoline engines; types and details of stationary explosion motors; kerosene, distillate, and crude oil motors; and farm motors—gas tractor power plants—electric-lighting plants.

The superiority of electrical power for agricultural operations, W. BECK (*Ztschr. Landw. Kammer Schlesien, 19* (*1915*), *Nos. 20, pp. 596–598; 21, p. 621*).—A brief statement of the amount of electrical power required for operating different agricultural machines is given.

Coatings for cement vats (*California Sta. Rpt. 1915, p. 31*).—"Laboratory tests by the division of viticulture and enology indicate that coating of mixed paraffin and beeswax, paraffin, rosin, and beeswax, tasteles fossil asphalt, such

as Gilsonite, applied in solution or melted with paraffin or Saracen wax, are more satisfactory than any of the commercial paints tried."

RURAL ECONOMICS.

The marketing of Wisconsin potatoes, H. C. Taylor (*Wisconsin Sta. Bul. 256 (1915), pp. 38, figs. 24*).—The author has estimated that Wisconsin markets outside of the State from 20,000,000 to 25,000,000 bu. of potatoes per year. By assuming the per capita consumption to be 5 bu. he has estimated that 20 per cent of the total potatoes entering interstate commerce comes from Wisconsin, 25 per cent from Maine, 24 from Michigan, 16 from Minnesota, and 8 from Colorado. Wisconsin potatoes are consumed principally through the North Central States.

The storage of potatoes is performed largely by farmers. Dealers' warehouses in the potato district of central Wisconsin would, if full, hold only about one-third of the potatoes grown in that region.

The author claims that the price paid for potatoes when they reach their desination is influenced greatly by their appearance when the car is opened. If machinery for grading potatoes were more generally used Wisconsin potatoes would have a wider market and bring better prices.

He has classified the potato buyers into three groups—the big distributing companies, the local independent buyers, and the managers of farmers' companies. He claims the last-named can perform the function of grading, handling, and loading cars more cheaply than the others. The large companies spend more than $1,000 a month on telephone and telegraph messages. This service is essential to the efficient direction of the potato shipments but must affect large quantities in order to be economical. Generally, the farmers' companies do not handle sufficient quantities to warrant such a service.

Chicago, the greatest market for Wisconsin potatoes, demands potatoes shipped in bulk so that they may be sorted before sacking for the city trade. This is an expensive system which might be done away with by careful grading at loading stations. He finds that the middlemen charges vary according to the service rendered and the bargaining power of dealers, buyers, and producers. The farmer reaps the principal benefit of rising prices and must stand the loss if prices are low.

Farmers' market bulletin (*North Carolina Sta., Farmers' Market Bul., 2 (1915), No. 12, pp. 29*).—In this bulletin is given the history of the Currituck Produce Exchange. Its failure, as at first organized, in the cooperative sale of potatoes is attributed mainly to the fact that the inspection was not of a character to establish a reputation for grade. Upon reorganization an inspector was employed from without the local community, and a standard grade was established which made the exchange very effective as a sales agency.

There is also included in the bulletin a form of by-laws for a growers' cotton marketing association, and comments regarding the prices received for 1914 apples. The usual list of growers having produce for sale is given.

Proceedings of the seventy-fifth annual meeting of the New York State Agricultural Society, 1915 (*N. Y. Dept. Agr. Bul. 71 (1915), pp. 1579–1796, pls. 41, figs. 6*).—Among the papers read at this meeting were a number relating to the organization of cooperative enterprises by farm bureaus, the marketing and transportation of agricultural produce, and factors that make for success in agricultural cooperation.

Agricultural achievements and problems in North Carolina, W. A. Graham (*Bul. N. C. Dept. Agr., 36 (1915), No. 7, pp. 3–21*).—The author shows the progress of agricultural production in North Carolina in the last fifty years,

and compares it with conditions in other States. He also describes the work of the different divisions of the North Carolina Department of Agriculture to improve agricultural conditions within the State.

Report of the Rural Credits Commission (*Salem, Oreg.: State, 1915, pp. 35*).—In this report to the twenty-eighth Legislative Assembly of Oregon a brief description is given of the various types of cooperative organizations, such as the Rochdale societies of Great Britain, the Raiffeisen and Schulze-Delitzsch in Germany, the breeding and marketing organizations of Denmark, and the Irish Agricultural Organization Society. Recommendation is made that a national Landschaften or mortgage credit system be established for furnishing short-term loans to farmers, that the States pass laws for the organization of cooperative societies and that there be a state federation of farmers' organizations, state control of live-stock breeding, and a simplification of land registration.

How debtors and creditors may cooperate (*Saskatchewan Dept. Agr. [Pamphlet], 1915, Aug. 1, pp. 4*).—In determining what claims should be paid first, the following are considered as preferred—operating expenses, such as wages, thrashing, taxes, groceries, twine, rent, blacksmithing, and repairs; bank loans; and interest on mortgages; and the following as ordinary claims—land, lumber, machinery, and all other items of equipment. If a farmer has not sufficient money to pay all claims, it is believed he should pay all items classed as preferred, as well as interest on all other debts, or, if he can not do this, he should pay a part of all his preferred claims and interest on all ordinary claims.

It is pointed out that "debtors could also avoid trouble by knowing accurately their ability to pay and, if they have to make promises, by remembering that the time of performance will soon arrive and that he who performs what he promises is more popular than he who promises and fails to perform."

It often happens that debtors are forced by special collectors to give some creditor a preference to which he is not entitled, and is hence unable to pay the others what he would like to pay them. Cooperation among creditors is suggested to do away with this practice.

Fifty years of agricultural politics, 1865–1915, A. H. H. MATTHEWS (*London: P. S. King & Son, Ltd., 1915, pp. XV+431, pls. 7*).—This book gives a historical sketch of the efforts of the British Central Chamber of Agriculture to effect legislation regarding cattle diseases, local taxation, land tenure, railway rates and conditions, establishment of a board of agriculture, malt taxes, fraudulent competition, and agricultural education.

Report and tables relating to Irish agricultural laborers (*Dept. Agr. and Tech. Instr. Ireland, Agr. Statis. 1914, pp. 35*).—This report shows the number of migratory agricultural laborers, the source, destination, and total supply of agricultural labor, and the average rate of money wages paid.

Connecticut agriculture: List of farms for sale, 1915 (*Hartford, Conn.: Bd. Agr., 1915, pp. 157, pl. 1, figs. 16*).—There is given in this report a general description of the agriculture of Connecticut, together with the annual list of farms for sale (E. S. R., 32, p. 390).

Studies in farm tenancy in Texas (*Bul. Univ. Tex., No. 21 (1915), pp. 151, figs. 32*).—The following topics are discussed in this bulletin: The growth and development of tenancy in Texas; the personal property of the tenant; sources of credit and capital for the tenant; the chattel mortgage and the one-crop system; financing the production of live stock; rents and the bonus system; the economic aspects of the tenant problem in Ellis County, by W. E. Leonard; personal experiences of tenants and landowners who have been tenants; and farm tenancy and the public schools, by E. V. White.

Commercial organizations of the United States (*U. S. Dept. Com., Bur. Foreign and Dom. Com., Misc. Ser. No. 28 (1915), pp. 104*).—There is included in this report a list of national, state, and local organizations, giving the number of members, purpose of organization, annual income, and special activities. Among these organizations are a number of associations relating to agriculture.

The American country girl, MARTHA F. CROW (*New York: Frederick A. Stokes Co., 1915, pp. VIII+367, pls. 15*).—In this book the author has described the life of the country girl and the problems she has to solve, and gives suggestions for the upbuilding of better rural womanhood.

Monthly crop report (*U. S. Dept. Agr., Mo. Crop Rpt. 1 (1915), No. 6, pp. 53–64, figs. 9*).—This number gives the usual monthly estimates of the acreage, condition, and yield of the more important agricultural crops, the farm prices of important products, and the range of prices at important markets, with miscellaneous data, including charts showing monthly variation of crop prices.

The number of bales of cotton ginned from the growth of 1915, prior to September 25, 1915, was 2,900,007, as compared with 3,393,752 for 1914.

A special inquiry among the crop correspondents relative to the sales of farm products has been summarized as follows: "Of every $100 worth of product sold by all who reported, approximately $36 were for live animals, $20 were for the products of live stock, $40 were for crops, and $4 represented miscellaneous items. As the correspondents are representative farmers, the averages of their reports in the United States and in the larger States are probably nearly the same as the averages for all the farmers in the States.

"The character of farmers' sales varies widely in different sections of the country. In the cotton States, as would be expected, by far the greater part of the sales are as crops. Thus, in Georgia, for every $100 worth of products sold, $75 represents crops, $14 live animals, $8 animal products, and $3 miscellany. Even in Texas, regarded as a cattle as well as a cotton State, cotton so far predominates that $75 represents crops, $15 live animals, and $7 animal products out of very $100 of sales. It may be that the cattle section of the State is not so fully represented in the returns as the cotton section; but complete returns from all farmers probably would not materially modify these figures.

"New England farmers make most of their sales in the form of animal products, largely milk, butter, and eggs. In New York, $53 of every $100 of sales are for animal products, $14 are for live animals, $27 for crops, and $6 for miscellany. Vermont farmers sell only $10 of crops for every $100 of all sales."

[**International statistics of agriculture**] (*Ann. Statis. [France], 33 (1913), pp. 185*–193**).—These pages contain statistical data showing for practically all countries the area and production of wheat, oats, potatoes, and vineyards from 1850 to 1913, and the number of live stock from 1835 to 1910.

Statistical notes on the production, imports and exports, prices and maritime freights of cereals (*Internat. Inst. Agr. [Rome] Bul. Agr. and Com. Statis., 6 (1915), No. 9, Sup., pp. 39*).—In this supplemental report there has been estimated the 1915 crop to determine whether it is sufficiently large to meet the usual annual consumption.

In the Northern Hemisphere, which produces and consumes practically the entire cereal production, the quantities necessary for consumption during the year 1915–16 are calculated on the basis of the average of the quantities available during the last five years, 1910–11 to 1914–15. A surplus is estimated of 165,000,000 quintals of wheat, 40,000,000 of rye, 23,000,000 of barley, 75,000,000 of oats, and 31,000,000 of maize.

Yearbook of figures, 1914 (*Chicago: Drovers Journal Publishing Co., 1915, pp. 112*).—Contained in this pamphlet are data relating to receipts of live stock at the principal markets for 1914, and for Chicago the number of head, car loads, average weight of stock, and average, low, and high prices for a series of years.

General abstracts showing the acreage under crops and the number and descriptions of live stock in each County and Province, 1914–15 (*Dept. Agr. and Tech. Instr. Ireland, Agr. Statis. 1915, pp. 31*).—This annual statement gives statistical data showing the acreage in crops and the number of live stock and poultry by Provinces and Counties for 1914–15. There is also a summary statement for Ireland, as a whole, giving comparative data for earlier years.

[Agricultural statistics of France] (*Ann. Statis. [France], 33 (1913), pp. 113–133*).—These pages contain statistical data showing the acreage, production, average yield, and value of the principal agricultural crops for 1912, the number of live stock on December 31, 1913, and the prices of the principal agricultural products and provisions.

[Consumption of agricultural products in France] (*Ann. Statis. [France], 33 (1913), pp. 106*–117**).—There is given in these pages the production, imports and exports, and total and per capita consumption, from 1827 to 1913, of wheat, potatoes, sugar, wine, beer, tobacco, tea, coffee, cocoa, cotton, wool, and silk cocoons.

Annual report of the department of agriculture, Uganda, 1915 (*Ann. Rpt. Dept. Agr. Uganda, 1915, pp. 89, pl. 1*).—In addition to the reports of the different branches of the department relative to their work, there is included information concerning the number of live stock, area in crops, and area in agricultural products.

AGRICULTURAL EDUCATION.

The means and methods of agricultural education [in the United States and Canada], A. H. LEAKE (*Boston: Houghton Mifflin Co., 1915, pp. XXIII+273, pls. 13, fig. 1*).—The author gives an historical review of the development of agricultural education including some ancient records, and discusses some conditions of rural life; the rural elementary school and its improvement; teaching agriculture in the rural school, including the correlation of agriculture with other subjects, the place, purpose, and character of nature study, school and home gardens, hindrances to the introduction of nature study and agriculture, and benefits to be derived from the teaching of these subjects; the consolidation of schools; rural school extension comprising school credit for home projects, boys' and girls' agricultural clubs, school fairs, young people's institutes, short courses, and rural evening schools; secondary education in agriculture, including its monetary value, the advantages of agricultural instruction in existing high schools and their reorganizaation for such instruction, advantages and organization of separate or special agricultural high schools, the need of both, the course of study, and the need for specially trained teachers; the use of land in connection with the schools, and home projects; agricultural colleges—their purpose, struggles, place in the educational system, and future, the report of the Carnegie Foundation for the Advancement of Teaching regarding them, and the broader problems awaiting the colleges; the scope, organization, phases, and outlook for future development of the agricultural college extension service; institutes and other helps for the adult farmer; the women on the farm, including work for the farm girl in the elementary rural school and high school, household science in the home, col-

lege courses for women, women's institutes, and domestic science trains; the training of teachers, including the training of persons preparing to teach in rural schools and of teachers already in service, the training of teachers for higher schools, and the Graduate School of Agriculture; and the example of Denmark in cooperative work, its people's high schools, Royal Agricultural and Veterinary Institute, and rural organization.

Rural education: A complete course of study for modern rural schools, A. E. Pickard (*St. Paul, Minn.: Webb Publishing Co., 1915, pp. 429, figs. 154*).—This book treats of school organization and management from the modern standpoint of an industrialized rural school; that is, a redirected course of study in which a broader and better country life is the ultimate aim. It discusses the proper environment and the academic, industrial, and country life work of rural schools, including agriculture and agricultural and horticultural, animal husbandry, and home economics booklets; activities outside the schoolroom comprising the home credit plan, school gardens, and corn and tomato contests for children, and farmers' clubs and institutes, cow testing associations, the application of the tuberculin test and vaccination for hog cholera, demonstration work in fertilizers, pure seed, and alfalfa and drainage projects for adults, and the rural school as a social center; the Minnesota plan of association of rural schools with a central school for the purpose of getting the benefits of the agricultural and industrial work done in the latter, a description of the associated schools at Cokato, Minn., as typical of these schools, and the advantages to the rural communities of such association; and outlines of three-year courses for junior and senior high schools.

The summer traveling practice course as a means of teaching horticulture, J. E. Coit (*Cornell Countryman, 13 (1915), No. 1, pp. 28–32, 58, 60, fig. 1*).—This is a description of the work of the six weeks' summer practice course in citriculture which is a uniform requirement for graduation in the College of Agriculture of the University of California.

The course is taken at the end of the sophomore year, when the student has completed the four agricultural fundamentals, plant propagation, soil technology, genetics, and agricultural chemistry, but before he has chosen his major subject. Six units of credits are allowed, but the same number are simultaneously added to the total number required for graduation. The author has come to agree with the students in their belief that it would be better if the summer practice courses were given at the end of the junior year, after students have taken the general course in their major subject.

Observations on agricultural extension teaching, A. Schneider (*Landw. Jahrb. Bayern, 3 (1913), No. 6, pp. 259–268*).—Observations are given for the benefit of students and beginners in the work of itinerant instruction in agriculture on the selection of subjects, preparation of lectures, manner of address, advice to individual farmers, etc.

Some elementary lessons and experiments in agriculture for our Virginia boys, N. S. Mayo, A. Lockhart, and J. H. Binford (*Va. Dept. Agr. and Immigr., Farmers' Bul. 16 (1914), pp. 36, figs. 22*).—This publication contains lessons and experiments on the improvement of seed corn, judging corn, the composition and use of lime on the farm, a test for acidity in the soil, plant growth, cultivation, fertilizers and the part they take in the growth of crops, calculating a fertilizer formula, swine, a balanced ration, spraying fruit and truck crops, and directions for making a number of articles in wood, including a corn shocker, wagon jack, plank drag, bracket shelf, kitchen table, etc.

Exercises with plants and animals for southern rural schools, E. A. Miller (*U. S. Dept. Agr. Bul. 305 (1915), pp. 63, pls. 5*).—This guide for the teacher

contains outlines of simple exercises with plants and animals, arranged after a monthly sequence plan, for the first five grades in Southern rural schools. It is intended to serve as an approach to the study of formal or text-book agriculture in the upper elementary grades. Practical exercises and field trips, as well as correlations with other school subjects, are suggested. An appendix includes lists of birds and references to literature, and a planting table.

A manual of soil physics, P. B. BARKER and H. J. YOUNG (*Boston and London: Ginn and Co., 1915, pp. VI+101, figs. 14*).—This loose-leaf manual consists of exercises on the origin, composition, and physical properties of soils and the relation of these properties to methods of soil management. The work outlined is sufficient for two semesters with two laboratory periods a week, and is the outcome of ten years' experience in teaching the important physical properties of soils.

Lessons on cotton for the rural common schools, C. H. LANE (*U. S. Dept. Agr. Bul. 294 (1915), pp. 16, figs. 4*).—The author outlines 14 lessons and exercises in cotton growing to serve as a supplement to the organized school work in elementary agriculture in the rural common schools. Suggestive correlations with other school subjects and references to literature are included.

The wheat industry for use in schools, N. A. BENGTSON and DONEE GRIFFITH (*New York: The Macmillan Co., 1915, pp. XIII+341, pl. 1, figs. 134*).—This text for use in the upper grades of elementary schools consists of a study of the wheat plant, its cultivation and growth, harvesting, thrashing, local transportation and storage, production, marketing, and milling, the uses of wheat products, an industrial review, and wheat in Australia, Argentina, the United States, Canada, Asia, and Europe. Each chapter is followed by questions and exercises.

The science of home making, EMMA E. PIRIE (*Chicago: Scott, Foresman, and Co., 1915, pp. 404, pl. 1, figs. 39*).—This text, which is planned to cover two years of work but may be adapted to a shorter period, is intended for use in home economics classes of the grammer and lower high-school grades in both city and rural schools. It treats of (1) the home and its care, (2) the selection, preparation, and serving of food, including a chapter on the family budget and marketing, (3) the care and feeding of children and invalids, and (4) laundering. The underlying facts and principles of the various subjects are taken up and experiments, questions, and problems are included. Emphasis is given to the physiological facts of food and digestion, hygiene, sanitation, and the cost of material. An appendix contains supplementary recipes, lists of equipment for the kitchen and for cleaning and laundering, forms for household accounts, and a bibliography.

Outline for home furnishing and decoration, C. FLETCHER (*Utah Agr. Col. Ext. Div. Circ. 32 (1915), pp. 11*).—The outline is divided into 10 lessons and deals with principles governing beauty, exterior and garden treatment, and interior treatment. A bibliography is included.

First social agricultural week, October 3–10, 1913 (*Santiago, Chile: Universidad Catolica de Santiago, 1914, pp. LXXVIII+392, pl. 1, figs. 47*).—This report contains addresses made at the first social agricultural week in Chile, October 3–10, 1913, at the Catholic University of Santiago. The leading agriculturists of all the Provinces were invited to attend.

MISCELLANEOUS.

Annual Report of California Station, 1915 (*California Sta. Rpt. 1915, pp. 76, pls. 2, figs. 2*).—This contains the organization list and a report of the director on the work and publications during the year, as well as of the instruction and extension work of the college of agriculture. The experimental work recorded, not previously abstracted, is for the most part abstracted elsewhere in this issue.

Twenty-seventh Annual Report of Massachusetts Station, 1914 (*Massachusetts Sta. Rpt. 1914, pts. 1–2, pp. IX+69a+178, pls. 15, figs. 6*).—This contains the organization list, reports of the director and heads of departments, a financial statement for the fiscal year ended June 30, 1914, and reprints of Bulletins 156–162, previously noted. The report of the assistant agriculturist includes fertilizer tests with oat hay, raspberries, blackberries, rhubarb, asparagus, potatoes, corn, mixed hay, and soy beans, and variety tests of potatoes, the latter being noted on page 231. The report of the veterinarian is abstracted on page 275.

Twenty-eighth Annual Report of Nebraska Station, 1914 (*Nebraska Sta. Rpt. 1914, pp. XXXVI, figs. 5*).—This contains the organization list, a report as to the work and publications of the year, a report of the extension service of the college of agriculture, and a financial statement for the period ended June 30, 1914. Data as to field crops are abstracted on page 228 of this issue.

Report of the Eastern Oregon Branch Experiment Station, 1911–12, R. WITHYCOMBE (*Oregon Sta., Rpt. East. Oreg. Sta., 1911–12, pp. 60, figs. 19*).—The experimental work recorded in this report of the superintendent of the Eastern Oregon Substation is for the most part abstracted elsewhere in this issue. Plans of the new barn at the substation are also included.

County experiment farm law (*Ohio Sta. Circ. 155 (1915), pp. 4*).—The text of the Ohio laws pertaining to the establishment and maintenance of county experiment farms is given.

Monthly bulletin of the Western Washington Substation (*Washington Sta., West. Wash. Sta. Mo. Bul., 3 (1915), No. 7, pp. 19, fig. 1*).—This number contains brief articles on the following subjects: Developing a Small Poultry Farm, by H. L. Blanchard; Cover Crops for Berry Fields, by J. L. Stahl; Sprouted Grain as a Poultry Food, by V. R. McBride; Liming the Soil, by E. B. Stookey; and Concerning Ground Limestone, by W. A. Linklater.

NOTES.

California University.—From 452 replies to a questionaire sent out to students of the college of agriculture, it appears that 58.6 per cent were not brought up on farms and but 32.3 per cent came directly from farm homes. The period of actual farm work done by the students had averaged about 19 months. Nearly 57 per cent entered specifically for a general education in agriculture and 13.4 per cent for special training. Over 65 per cent considered general stock or fruit farming the ideal form of employment on graduation, while 14.8 per cent preferred government service, 5.5 per cent station work, 2.4 per cent college instruction, and 8.2 per cent school instruction. Over 30 per cent believed they would be financially able to begin farming on graduation.

Delaware College.—The tract of land purchased last spring with a gift of $218,000 from an anonymous source is being utilized for campus and building sites. It is expected that the new building for agriculture and science, provided under the gift previously noted (E. S. R., 33, p. 794), will be ready for occupancy in the spring of 1917 and the remodeled college hall in the following September.

Georgia Station.—The legislature has appropriated $2,500, available immediately. This is to be used to enlarge the laboratory space, keep up the buildings and grounds, extend the work to different parts of the State, and help meet the expenses of the quarterly meetings of the board of directors.

A. S. Chamlee, of Bartow, has been appointed to the board, vice M. G. Gamble.

Kansas College and Station.—The *Kansas Industrialist* states that R. W. Miller, instructor in chemistry, has resigned to accept a position with the Mellon Institute for Industrial Research of the University of Pittsburgh, and that C. E. Miller, instructor in soils, has become assistant professor of soils in the Michigan College. M. C. Sewell, superintendent of the Garden City substation, has been appointed assistant professor of soils

Massachusetts College and Station.—William H. Bowker, a graduate of the pioneer class of 1871 and a member of the board of trustees since 1885, died January 4 at the age of 65 years. Mr. Bowker was also widely known as a pioneer in the fertilizer industry in this country. As a member of the board of trustees, he served for many years on the experiment station committee as well as on other committees, and was also a member of the board of control of the Massachusetts State Station from 1892–1894. He was intensely interested in the work of the institution and in various capacities had rendered conspicuous service in its development.

Sumner R. Parker, 1904, of the Franklin County Farm Bureau, has been appointed assistant state leader in charge of county agent work, vice B. W. Ellis, resigned to engage in farming.

New Jersey College and Stations.—A. N. Hutchinson, assistant chemist, and A. C. Foster, assistant seed analyst, have resigned, the latter to become instructor in botany in the University of North Carolina. Recent appointments include the following: J. Marshall Hunter as assistant animal husbandman, Allen G. Waller as assistant in agronomy, Lawrence G. Gillam as extension specialist in

fruit growing, vice Warren W. Oley, resigned, and Louis K. Wilkins as field and laboratory assistant.

North Carolina College and Station.—The extension service is bringing the results of station work closely to the people of the State. Many newspapers and farm journals are now carrying one or more articles weekly and one of the local dailies is sending a reporter to the college each day for information. It is stated that as a result of work in Ashe, Allegheny, and Watauga counties, four cheese factories have been established and the output of cheese doubled in the past 10 months. Growing soy beans for oil production has also been encouraged.

J. D. McVean, who has had charge of the pig club work in the State, has been appointed pig club agent in the Bureau of Animal Industry of this Department, and was succeeded January 17 by B. P. Folk, the county agent of Gaston County. L. I. Case has been appointed assistant beef cattle field agent.

Ohio State University and Station.—The department of agronomy of the college of agriculture is carrying on a series of experiments to determine the effects of the calcium-magnesium ratio in the soil on bacterial life. Storage tests by two members of the senior class with celery are also in progress in cooperation with the station.

Oklahoma Station.—Wallace McFarlane, Ph. D., has been appointed in charge of the soil division of the agronomy work.

Oregon College.—The annual farmers' and home-makers' week was held at the college, January 3–10. In addition to the lectures and demonstrations, there were 21 conferences held by county and state organizations, including the State Grange and Farmers' Union, representatives of which agreed upon a basis for federating the various state organizations.

A conference of county agriculturists from 13 counties maintaining agents and the officers of the seven substations was held at the college January 10–15, with Paul V. Maris, the new state leader of farm demonstration work in charge.

H. C. Seymour, formerly superintendent of schools for Polk County, has been appointed state leader of girls' and boys' industrial club work, vice F. L. Griffin, whose resignation has been previously noted, and has entered upon his duties.

Rhode Island Station.—The experimental work of interest to market gardeners is to be extended by the addition of over 100 plats. The first main problem to be undertaken is to be a study of the feasibilty of the partial or complete substitution of green manures and commercial fertilizers for horse manure. This is stimulated by the real and prospective scarcity of the manure supply. An overhead irrigation system sufficient to deliver 80 gallons of water per minute from a nearby pond has been partly installed to determine the relative dependency upon water of the various soil treatments. The effect of certain crops upon those immediately following will also be studied.

L. S. Crosby, assistant in chemistry, has resigned to accept a commercial position.

New Entomological Laboratories in Canada.—Four new entomological laboratories were completed during the summer of 1915, located respectively at Annapolis Royal, Nova Scotia; Frederickton, New Brunswick; Treesbank, Manitoba; and Lethbridge, Alberta.

The laboratory at Frederickton is the most elaborate of these structures and is a two-story and basement brick building 24 by 30 feet, located on the campus of the University of New Brunswick. Its work has been especially directed toward the natural control of insects, notably the brown-tail moth, tent caterpillar, spruce budworm, and fall webworm. The laboratory at Annapolis Royal is a wooden one-story and basement building, 26 feet square. It is located on the county school grounds and is equipped with special reference to combating the brown-tail moth and for studies of the bud moth, fruit worm, and

other fruit pests. It replaces a former temporary laboratory at Bridgetown, which is to be used as a substation wherever most needed.

The laboratories at Treesbank and Lethbridge are of the bungalow type, the former being 12 by 16, and the latter, located on the Dominion substation farm, 23 by 20 feet.

Short Courses in the Agricultural Colleges.—The following is quoted from the editorial columns of *The Breeder's Gazette:*

"This is an open season for short courses. Some years ago neither short courses nor long courses interested many farmers. They knew what they knew, and college learning was not attractive to them. A lot of changes follow along with time, and one of the deepest significance is the altered attitude of farmers toward educational institutions. When short courses for a few weeks of the winter were first offered they were tested and found good, and facilities have been taxed as the years rolled on to give the necessary attention to the crowds of farmers who assemble. They are not young men. Indeed, some courses specifically bar men under 25 years of age. They are graybeards who want to lengthen their years of usefulness and increase their production by taking advantage of all the facts dug up by investigators and students whose work is to uncover truth. Some agricultural colleges this winter will fairly resemble army posts in dormitory equipment. An attempt will be made to give accommodations on the grounds to all who attend, and in one case we understand a draft has been made on the cots used by the state militia in order to provide enough beds for farmers attending the short courses. We are never too old to learn."

First National Conference on Church and Country Life.—This conference was held at Columbus, Ohio, December 8–10, 1915, under the auspices of the commission on the church and country life appointed in 1913 by the Federal Council of Churches of Christ in America. About 40 States and 30 religious denominations were represented and the attendance aggregated about 700. The agricultural colleges were strongly represented, as well as ministers in active service and leaders in the various denominations.

The meetings were opened by Rev. Washington Gladden, and with an address of welcome by Governor F. B. Willis of Ohio. The presiding office? was Gifford Pinchot, who declared that "we in America may be certain that the life in the country can not be fine and strong unless it is strengthened by an active and efficient church."

The primary object of the conference was declared to be to bring to the attention of the people in general the present condition of the country church rather than to offer a specific plan for action. As an index to conditions, an incomplete rural church survey in Ohio was presented showing that 83 per cent of these churches had less than 100 members and 21 per cent less than 25 members, while less than 40 per cent of the rural population were members of any church. Only one church in 16 had its individual minister, and one church in 9 had been abandoned entirely within the last few years.

Committee reports were presented dealing with various aspects of the problem. That on the country church, its function, policy, and program was given by President Kenyon L. Butterfield, of Massachusetts, who defined the function of the country church as "to create, to maintain, and to enlarge both individual and community ideals under the inspiration of the Christian motive and teaching, and to help people to incarnate these ideals in personal and family life, in industrial effort, in political development, and in all social relationships."

The committee report on the church as a community center by Dr. Earp, of Drew Theological Seminary, pointed out that a "community center means, not as many have thought the bringing of everything into the church, but rather

spreading its influence out into the community and into everything affecting men's lives."

A plan proposed by the Massachusetts Federation of Churches was presented by the committee on training of the rural ministry. This plan recognized that the country minister should be as able and as thoroughly equipped a man as any other minister and should be trained for leadership. C. J. Galpin, of the University of Wisconsin, presented a plan calling for a nondenominational theological school to be located in close proximity to some agricultural college in the middle West for the preparation of rural ministers. He believed that this might counteract the prevailing drift of the ministry to city churches.

Prof. John Fiske, of Oberlin College, presented a report on financing the country church, calling attention to its opportunities as a nearby missionary field. He also maintained that if highly endowed and trained men would permanently enter the field, country people would finance their own churches in due season.

A report on The Allies of the Country Church discussed the Young Men's Christian Association and the Young Women's Christian Association. Miss Jessie Field discussed the position of the country girl in any scheme for community betterment.

President W. O. Thompson, of Ohio State University, gave an address on The Country Church and Rural Activities, and Rev. Dr. Mosiman on the Social Responsibility of the Church to Its Community, including not only the various religious groups but the foreign-born, class groups such as tenants and hired help, young people without special ties, and the like.

A notable feature of the conference was the address of President Wilson, who spoke of some results of the past and some opportunities in the future. He maintained that "the church has depended too much upon the individual example. We must have more cooperation, the vital principle of social life. . . . Surely the church is the instrumentality by which rural communities may be transformed; and surely there is nothing in the country community in which the church ought not to be the leader and actual vital center." He enumerated the encouragement of cooperative buying and marketing among farmers and the quickening of the social life as special fields of opportunity.

Nearly all the speakers referred to the extension and other work of the agricultural colleges, and many pleaded for a closer cooperation between the rural churches and these institutions. A policy of cooperation rather than of competition was also strongly advocated between the churches themselves.

Agriculture at the British Association.—The topics under discussion at the 1915 session of the section on agriculture dealt especially with problems pertaining to the maintenance and improvement of the food supply.

The presidential address of R. H. Rew reviewed the existing situation, showing a substantial increase in production in Great Britain during the past year. T. H. Middleton compared the relative efficiency for food production of different systems of farming, advocating greater attention to dairying. J. M. Cail discussed the probable effect of the War on the Future of Agriculture in Scotland, and W. H. Thompson took up the situation as regards Ireland. J. Hendrick and E. T. Halnan discussed respectively the outlook with regard to supplies of fertilizers and feeding stuffs. Reducing prevailing wastes of liquid manure and utilizing seaweeds were suggested for conserving the potash supply, while dried yeast and palm-nut cake were described as new feeding stuffs of promise. W. Somerville reported pot culture tests which indicated an accumulation of fertility in grass land from the use of basic slag. T. B. Wood cited the introduction of new feeding stuffs and the prevention of waste

in feeding as instances of ways in which the agricultural scientist may render direct service to the practical feeder.

Labor and labor-saving machinery were considered by W. J. Malden, who pleaded for a reform in educational methods in rural schools to provide opportunity for training in handling machinery. Thomas Wibberley discussed the economics of continuous cropping with especial reference to results secured by him in Ireland. A paper by D. MacPherson and W. G. Smith classified into five types the upland grazing lands of Scotland with reference to their economic value and possibilities of improvement. A. G. Ruston, under the topic The Plant as an Index of Smoke Pollution, claimed a direct correlation between the degree of atmospheric pollution and the activity of plant growth, the chemical composition of the plant, the activity of the plant enzyms, and the vitality of the seed.

The problem of determining the cost of feeding in milk production was taken up by J. Mackintosh, C. Crowther, and A. G. Ruston, and showed a diversity in methods and opinions. A. Lauder reported experiments in feeding calcium phosphate to cows without effect on either the yield or composition of milk. The studies of Professor Crowther indicated that the method of milking may have an appreciable influence on the milk and that the time factor apparently enters into the problem.

The meetings of the section were well attended and much interest is reported in the papers and discussions.

Progress in Agricultural Instruction in Latin America.—A recent decree of the department of agriculture of Argentina established a practical home school of agriculture at Tandil, the first of its kind to be founded in the Republic. An industrial school for women and girls between the ages of 8 and 30 years has been opened in the city of Buenos Aires for the purpose of teaching them useful occupations. Similar schools are to be organized elsewhere.

The President of Brazil, with the object of encouraging the growing of cotton, has established a bureau of cotton in the department of agriculture, to conduct experiments with different species and to give advice to agriculturists desiring to engage in its cultivation. A recent executive decree also establishes an agricultural chemical bureau in the city of Rio de Janeiro, to assist and cooperate with persons engaged in agricultural pursuits and to aid in the development of the industry. The governor of the State of Sao Paulo has appointed Emilio Castelho, agronomist in the agricultural school at Sao Paulo, to study the export business of grasses, Indian corn and other cereals, and alfalfa in Argentina.

The Government of Chile has appropriated $9,490 for the maintenance of the agricultural farm and $8,358.50 for the agricultural school at the Quinta Normal de Agricultura, Santiago.

According to a recent message of President Alfredo Gonzales, of Costa Rica, the results of the rural agricultural schools have been so satisfactory that the department of agriculture proposes to establish 50 such schools with practical and theoretical instruction, and to increase this number as the needs of the country require. A proposed plan for the founding of a school of industrial arts and a school of agriculture in the cities of Alajuelita and Cartago is also being considered. A new board of agricultural credit, with Ramon Solano as president and Rosalia Carreras as secretary, has been organized in the Alajuelita Canton. The first annual celebration of Arbor Day was held by the public schools on June 15, 1915.

Doctor Arias of the department of agriculture of the Government of Cuba has taken steps to introduce instruction in bee culture into the agricultural schools of the Republic. Three agricultural schools have been established in the Provinces of Pinar del Rio and Havana.

A board of agriculture has been organized in the Department of Zacapa, in Guatemala, with Federico Castañeda, president, and Antonio E. Lima, secretary. A similar board has been organized at El Progreso with José María Calderon, president, and Pedro Archila, secretary.

A practical school for girls was opened in Tegucigalpa, Honduras, in 1915, with instruction in various branches of home economics.

On the recommendation of a number of agricultural students of Merida, preliminary steps have been taken by several prominent citizens of the State of Yucatan, Mexico, to establish an agricultural experiment station, the Mexican agronomist, Francisco Vega y Loyo, being one of the leaders in the undertaking. It is proposed to get into communication with the principal Mexican experiment stations as well as those of the United States and Europe.

A rural normal school, the second of its kind established in Paraguay, was inaugurated in 1915. Stock raising is to be included in the subjects of instruction. The agricultural school at Asuncion has aided greatly in the introduction of improved methods concerning the feeding and breeding of stock in the more thickly populated sections of the Republic, and particularly in influencing small farmers to give attention to the forage questions by recommending the cultivation of suitable grasses and legumes for feeding purposes.

Graduate School of Agriculture.—The program of the seventh session of the Graduate School of Agriculture, under the auspices of the Association of American Agricultural Colleges and Experiment Stations, to be held at the Massachusetts Agricultural College, Amherst, Mass., July 3–28, 1916, will include courses on the fundamental factors of the growth of plants and animals from physical, chemical, and biological viewpoints, agricultural and economic problems of production and distribution, land problems, rural organization, and principles and methods of teaching. There will also be conferences on the scientific basis of agriculture, making the farm pay, farm finance, social factors of rural progress, and training of men for agricultural service. Opportunities for inspection and study of features of the intensive agriculture of New England will be offered through excursions under expert guidance during and after the session of the school.

Miscellaneous.—The incoming officers of the American Phytopathological Society, elected at the Columbus meeting, December 28–31, 1915, are as follows: President, Dr. E. F. Smith, of this Department; vice-president, Dr. M. T. Cook, of the New Jersey College and Station; secretary-treasurer, Dr. C. L. Shear, of this Department; and members of the council, Dr. F. D. Kern, of the Pennsylvania College and Station, and Dr. E. C. Stakman, of the Minnesota University and Station. Dr. W. A. Orton was elected one of the chief editors of *Phytopathology* and H. T. Gussow, Dr. C. W. Edgerton, Dr. Stakman, and Dr. V. B. Stewart, associate editors.

George L. Fawcett, from 1908 to February, 1915, plant pathologist at the Porto Rico Federal Station, has been appointed professor of mycology and bacteriology at the University of Tucuman, Argentina.

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The Agricultural Experiment Stations of the United States.

U. S. DEPARTMENT OF AGRICULTURE
STATES RELATIONS SERVICE
A. C. TRUE, DIRECTOR

Vol. XXXIV MARCH, 1916 No. 4

EXPERIMENT STATION RECORD

WASHINGTON
GOVERNMENT PRINTING OFFICE
1916

U. S. DEPARTMENT OF AGRICULTURE.

Scientific Bureaus.

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BUREAU OF ANIMAL INDUSTRY—A. D. Melvin, *Chief.*
BUREAU OF PLANT INDUSTRY—W. A. Taylor, *Chief.*
FOREST SERVICE—H. S. Graves, *Forester.*
BUREAU OF SOILS—Milton Whitney, *Chief.*
BUREAU OF CHEMISTRY—C. L. Alsberg, *Chief.*
BUREAU OF CROP ESTIMATES—L. M. Estabrook, *Statistician.*
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OFFICE OF EXPERIMENT STATIONS—E. W. Allen, *Chief.*

THE AGRICULTURAL EXPERIMENT STATIONS.

ALABAMA—
- College Station: *Auburn;* J. F. Duggar.[a]
- Canebrake Station: *Uniontown;* L. H. Moore.[a]
- Tuskegee Station: *Tuskegee Institute;* G. W. Carver.[a]

ALASKA—*Sitka:* C. C. Georgeson.[b]
ARIZONA—*Tucson:* G. F. Freeman.[c]
ARKANSAS—*Fayetteville:* M. Nelson.[a]
CALIFORNIA—*Berkeley:* T. F. Hunt.[a]
COLORADO—*Fort Collins:* C. P. Gillette.[a]
CONNECTICUT—
- State Station: *New Haven;* } E. H. Jenkins.[a]
- Storrs Station: *Storrs;* }

DELAWARE—*Newark:* H. Hayward.[a]
FLORIDA—*Gainesville:* P. H. Rolfs.[a]
GEORGIA—*Experiment:* R. J. H. De Loach.[a]
GUAM—*Island of Guam:* A. C. Hartenbower.[b]
HAWAII—
- Federal Station: *Honolulu;* J. M. Westgate.[b]
- Sugar Planters' Station: *Honolulu;* H. P. Agee.[a]

IDAHO—*Moscow:* J. S. Jones.[a]
ILLINOIS—*Urbana:* E. Davenport.[a]
INDIANA—*La Fayette:* A. Goss.[a]
IOWA—*Ames:* C. F. Curtiss.[a]
KANSAS—*Manhattan:* W. M. Jardine.[a]
KENTUCKY—*Lexington:* J. H. Kastle.[a]
LOUISIANA—
- State Station: *Baton Rouge;* }
- Sugar Station: *Audubon Park, New Orleans;* } W. R. Dodson.[a]
- North La. Station: *Calhoun;* }

MAINE—*Orono:* C. D. Woods.[a]
MARYLAND—*College Park:* H. J. Patterson.[a]
MASSACHUSETTS—*Amherst:* W. P. Brooks.[a]
MICHIGAN—*East Lansing:* R. S. Shaw.[a]
MINNESOTA—*University Farm, St. Paul:* A. F. Woods.[a]
MISSISSIPPI—*Agricultural College:* E. R. Lloyd.[a]
MISSOURI—
- College Station: *Columbia;* F. B. Mumford.[a]
- Fruit Station: *Mountain Grove;* Paul Evans.[a]

MONTANA—*Bozeman:* F. B. Linfield.[a]
NEBRASKA—*Lincoln:* E. A. Burnett.[a]
NEVADA—*Reno:* S. B. Doten.[a]
NEW HAMPSHIRE—*Durham:* J. C. Kendall.[a]
NEW JERSEY—*New Brunswick:* J. G. Lipman.[a]
NEW MEXICO—*State College:* Fabian Garcia.[a]
NEW YORK—
- State Station: *Geneva;* W. H. Jordan.[a]
- Cornell Station: *Ithaca;* B. T. Galloway.[a]

NORTH CAROLINA—
- College Station: *West Raleigh;* } B. W. Kilgore.[a]
- State Station: *Raleigh;* }

NORTH DAKOTA—*Agricultural College:* T. P. Cooper.[a]
OHIO—*Wooster:* C. E. Thorne.[a]
OKLAHOMA—*Stillwater:* W. L. Carlyle.[a]
OREGON—*Corvallis:* A. B. Cordley.[a]
PENNSYLVANIA—
- *State College:* R. L. Watts.[a]
- *State College:* Institute of Animal Nutrition; H. P. Armsby.[a]

PORTO RICO—
- Federal Station: *Mayaguez;* D. W. May.[b]
- Insular Station: *Rio Piedras;* W. V. Tower.[a]

RHODE ISLAND—*Kingston:* B. L. Hartwell.[a]
SOUTH CAROLINA—*Clemson College:* J. N. Harper.[a]
SOUTH DAKOTA—*Brookings:* J. W. Wilson.[a]
TENNESSEE—*Knoxville:* H. A. Morgan.[a]
TEXAS—*College Station:* B. Youngblood.[a]
UTAH—*Logan:* E. D. Ball.[a]
VERMONT—*Burlington:* J. L. Hills.[a]
VIRGINIA—
- *Blacksburg:* W. J. Schoene.[c]
- *Norfolk:* Truck Station; T. C. Johnson.[a]

WASHINGTON—*Pullman:* I. D. Cardiff.[a]
WEST VIRGINIA—*Morgantown:* J. L. Coulter.[a]
WISCONSIN—*Madison:* H. L. Russell.[a]
WYOMING—*Laramie:* C. A. Duniway.[c]

[a] Director. [b] Agronomist in charge. [c] Acting director.

EXPERIMENT STATION RECORD.

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RURAL ECONOMICS.

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LIST OF EXPERIMENT STATION AND DEPARTMENT PUBLICATIONS REVIEWED.

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U. S. Department of Agriculture—Con.

[a] Printed in scientific and technical publications outside the Department.

EXPERIMENT STATION RECORD.

Vol. XXXIV. March, 1916. No. 4.

The death of Dr. E. W. Hilgard, of California, closes a notable career of service to agriculture, both in length and in accomplishment. It marks the passing of the last of the earlier group of pioneers in agricultural education and research. The work he did dealt with the very fundamentals of agricultural advancement, at a period when men saw the needs less clearly and few were qualified to carry the work forward. Gauged by the time and opportunity, it will remain a great work. Who shall attempt to measure the result of it, or the influence of the high standards he set!

It is the habit to pay tribute to men of greatness after their work is closed and they are no longer able to read such words of praise. It seems far better to recognize a man's service while he is doing it, and to give him the sense of appreciation. Happily, the world did not wait until retirement or death to honor Dr. Hilgard. Reward came in his active years, in a world-wide recognition and esteem which gave him an undisputed place among the leaders, and in the realization of his vision of the place of agriculture in the university and the State.

Three universities conferred the degree of doctor of laws upon him; the University of Heidelberg, where he studied, reissued the doctor's degree to him in 1903 as a "golden degree," in recognition of a half century's work for science; and the Academy of Sciences of Munich presented him with the Liebig medal for distinguished achievements in agricultural science. These academic honors reflect the high esteem in which he was held as a man of science. In his State and in his university he was honored and revered, and among the representatives of agricultural research and education he was long accorded a foremost place.

These were the rewards of a life work which had been done under many difficulties and discouragements. Backwardness in recognizing our agricultural institutions made financial support meager and opportunity and encouragement correspondingly limited. But in some way he found time and means to carry forward his investigation, and thus help to lay broad and deep the foundation for agricultural teaching. It was here that his service was most noteworthy. His later years were gladdened by the new order, which placed agriculture in a high position in the university and in the life of the people. This gave to his life a rich measure of fulfillment.

A short review of Dr. Hilgard's career and its principal lines of activity was given in these pages at the time of his retirement from active service in 1909. In this the attempt was made to bring out the prominent features of his varied service and the chief lines in which his greatest accomplishments had been made. Since that time, although laboratory facilities were open to him, his health had not permitted very active participation in research and the contributions from his pen had been small. With clear mind but waning physical strength he gradually resigned his work to the new regime, realizing that while unfinished plans remained, in an unusual degree his part had been completed.

From the facts of his life it is interesting to note that he was born at Zweibruecken in Rheinish Bavaria January 5, 1833, and was brought to this country by his parents when only three years old, the family settling at Belleville, in southern Illinois. There young Hilgard grew up, attended the public schools, and worked on his father's farm. After graduation from the high school he was sent to the University of Heidelberg, where he pursued studies in chemistry and geology especially, and received his degree as doctor of philosophy in 1853.

Returning to this country he became chemist in 1855 of the newly established Smithsonian Institution at Washington, but soon resigned to accept a position in Mississippi, and from 1858 to 1872 his work was largely in the field of geology. In that period began his writing upon soils—the maintenance of fertility, interpretation of soil analysis, etc. He went to the University of Michigan in 1872 and was called from there to the University of California in 1875.

The California College of Agriculture, though considered the real nucleus of the state university, was then in an undeveloped state, and upon Professor Hilgard fell the task of giving it form and plan, and gradually building for it a confidence and support which made possible its later advancement to a position among the leading institutions of its kind. As a recent writer has well said: "The results of his labors are the warp of California's first half century of intellectual and industrial life, and upon such enduring work as he achieved will be spread the splendid fabric of our coming state advancement and development."

Outside of his university duties Dr. Hilgard found time for much important work. He was in charge of the agricultural division of the Northern Transcontinental Survey, 1881–1883, and as chairman of a commission appointed by the U. S. Commissioner of Agriculture on the agriculture of the arid regions, he edited a report which dealt with the climate and agricultural features and the agricultural practice and needs of the arid regions of the Pacific slope. He conducted an extensive investigation of the soils of the cotton-growing

States, in connection with the report on cotton production, with which he was charged under the tenth census.

His writings were extensive, and his reports were widely sought, for they were alive with the results of new work and constructive reasoning. He saw beyond his work, and with clear purpose and keen perception he advanced the boundaries of knowledge and clarified the field in what had hitherto proved a most difficult field of inquiry. In characterizing his qualities as an investigator, the *Pacific Rural Press* says: "He possessed notably the creative faculty in thought. He was quick to see his opportunities of public service, to recognize his duty therein, and he was masterful and tireless in pursuit of it. He was bold in his conquest of truth and fearless in his use of it for the interests of mankind. His great undertaking was in natural science and its relations to agriculture, seizing gladly the foremost fact from research and pressing it to the humblest service, but always preserving and enforcing the relations of both the fact and the service to the broadest interests of his State and of his fellow men."

Beyond this, he was "unswervingly true and deeply patriotic and humanistic—a man whose thinking was clear and whose motives were as unselfish as his service of them was forceful and effective."

It may not be generally known that Dr. Hilgard was at one time invited to accept the appointment of U. S. Commissioner of Agriculture and later the Secretaryship, but his distaste for administrative details on so large a scale led him to decline acceptance. He preferred at that stage to remain in the service of the State and the institution to which he had given the best part of his active life. The necessity for guarding his health in recent years cut him off from travel and from participation to any large degree in the activities of scientific societies and similar bodies, whose work he followed with deep interest.

Personally, Dr. Hilgard was a kindly man, gentle, sympathetic, looking for the best in others as he gave of the best in himself. His bright genial nature and his unfailing courtesy gave him a wide circle of warm friends, and he won the loyalty and affection of those who came in close association with him. In the highest and best sense he exemplified the scholar, but his humanity was never lost in his scholarship.

Strong, forceful, with a zealcus love for truth, he made a very definite contribution to his generation, and he left a name which will long be revered.

The Second Pan American Scientific Congress, held at Washington, D. C., from December 27, 1915, to January 8, 1916, was an occasion of considerable interest from various points of view, among

them that of agriculture. It constituted the first assemblage in the name of science to be held in North America by representatives of the republics of the Western Hemisphere, thus bringing into closer relations and acquaintanceship a body of scientific workers with many interests in common but hitherto relatively strangers. The wide range of topics embraced in the two weeks' program served to reveal in a comprehensive manner the substantial progress which the Pan American nations have been making along many scientific lines, as well as to indicate some ways in which these countries may collectively advance scientific progress in several directions in which their interests are mutual.

The official nature of the congress constituted one of its distinguishing features, and attested the realization by the governments of the participating nations of the importance of fostering scientific work. Appropriations aggregating $85,000 were made by the United States for the expenses of the congress, and the invitations to the Pan American nations to send delegates were extended by the Secretary of State. Membership in the congress included official delegates and also representatives of universities, societies, and various scientific bodies. The list of institutions and societies in this country appointing delegates was a long one, and included this Department, the United States Bureau of Education, many of the agricultural colleges, and a considerable number of societies immediately associated with agricultural science. Delegates from the entire twenty-one Pan American nations eligible were in attendance, and with the unofficial delegates made up an aggregate membership of several hundred persons.

The congress was organized into nine sections, most of which were further extensively subdivided. None of these sections was devoted exclusively to agricultural science, but Section III on the conservation of natural resources included subsections on the conservation of the animal and plant industry and forests, irrigation, and the marketing and distribution of agricultural products. Agricultural education constituted a subsection of Section IV, Education, and meteorology and seismology a subsection of Section II, with considerable attention to agricultural meteorology. In Section V, Engineering, papers were presented on such branches as the engineering features of irrigation and drainage, highway engineering, farm implements and machinery, and sewage disposal; and in Section VII, under economic geology and applied chemistry, the topics dealt with included the conservation and handling of the nitrate and phosphate resources, the preservation of foods, and chemical problems related to rubber and the utilization of pine forest products. Section VIII, Public Health and Medical Science, included discussions of insect-borne dis-

eases, tuberculosis, nutritional problems and diseases, the food, milk, and water supply, immunity and anaphylaxis, and similar problems.

One of the avowed objects of the congress was to promote closer relations between the participating nations by making them more familiar with each other's conditions and problems. Many of the papers, therefore, took the form of reviews of the trend of recent progress in the respective fields. Another group of papers was prepared with special reference to administrative problems, such as plant and animal quarantines, the establishment of research organization in such branches as entomology and forestry, the extension of the meteorological service, and the feasibility of more effective cooperation along these lines. There were also numerous papers reporting results of research, notably along economic lines and in the section on public health and medical science.

The prominent recognition given to agricultural science is illustrated by the program of the section on conservation, of which Mr. George M. Rommel, of the Bureau of Animal Industry of this Department, was chairman. About eighty papers were presented before this section, of which over sixty dealt directly with agriculture. These papers covered a wide range of subjects, but gave special attention to the lines of animal industry, the marketing of agricultural products, irrigation, and forestry.

The function of live stock in agriculture was described by Mr. Rommel to be sevenfold, including the maintenance of soil fertility, the rendering more salable or more profitable the feeding stuffs produced on the farm, the supplying of motive power, the provision of a major source of income, the improving of the farm business organization, the furnishing of meat to the farm table, and the increasing of the attractiveness of farm life. Prof. B. H. Rawl, of the Dairy Division, maintained that dairying more nearly meets the requisites of a permanent industry than any other system of agriculture, since it gives opportunity for the steady employment of intelligent labor and maintains the fertility of the soil, and when properly managed it is also profitable.

Prof. F. R. Marshall, likewise of the Bureau of Animal Industry, discussed the relation between wool and mutton production in the sheep industries of North and South America; Prof. H. W. Mumford, of the University of Illinois, the relation of feed and environment to the profitable fattening of cattle; and President H. J. Waters, of the Kansas College, took up the question of how an animal grows. The principles and system followed in the government control of grazing on the public lands were outlined by Mr. A. F. Potter, of the Forest Service, and the marketing of live stock

and meats through the great central markets was discussed by Prof. L. D. Hall, of the Office of Markets and Rural Organization. Recent progress in the development of methods for the control of parasites of live stock was epitomized by Dr. B. H. Ransom of the Bureau of Animal Industry.

The formation of an international veterinary police was advocated by Dr. José Leon Suarez of Argentina, and the feasibility of adopting uniform regulations was discussed by Dr. A. D. Melvin of the Bureau of Animal Industry, Dr. Rafael Munoz Jiminez of Uruguay, and Dr. Francisco Etchegoyen of Cuba.

The papers relating to plant industry were somewhat less numerous but covered a wide range of subjects. Mention may be made of five papers from the Bureau of Plant Industry, namely, a discussion of the water requirements of crops as determined in several localities by Drs. L. J. Briggs and H. L. Shantz; plant introduction opportunities open to the Americas, presented by Mr. David Fairchild; the possibilities of intensive agriculture in tropical America, discussed by Prof. O. F. Cook; tropical varieties of maize, by Mr. G. N. Collins; and the animal organisms of the soil by Dr. N. A. Cobb. Among the papers from Latin America were a discussion of manganese as a plant food, by Prof. Maimo Sarasin of Uruguay, and on the conservation of industrial plants, by Prof. Rafael Pinel Batres of Guatemala.

A lecture by Prof. C. D. Smith, formerly of the Michigan College and Station, on the resources of Brazil dealt with various lines of conservation. There was also numerous papers dealing with irrigation problems, and a special discussion by several speakers of plant quarantine regulations and the possibility of Pan American cooperation in the combating of insect pests and plant diseases.

A notable feature in the forestry discussions was the large attention given to conditions outside this country. Thus Mr. R. Zon, of the Forest Service, presented an estimate of South American timber resources, from which he concluded that although the total forest area is 1,924,000,000 acres, the Continent can not be considered as a future source of supplies for the most commonly used woods. Dr. Cristobal Hicken, of the University of Buenos Aires, discussed the botany of the forest regions of southern Patagonia, as revealed by his recent explorations. Major G. P. Ahern described forestry conditions in the Philippine Islands and the organization of the insular forest service, and Barrington Moore discussed the need of scientific forestry for Latin America.

The adoption of a definite forest policy and the maintenance of a forest service by the nations of Central and South America was recommended by Dr. Elias Leiva Quiros, of Costa Rica, who believed

that the restriction of exploitation to the limits of natural production was the chief conservation measure necessary. The development of a national forest policy was also the theme of Prof. H. S. Graves, of the Forest Service, who maintained that public ownership of timber land does not, as is sometimes claimed, retard development but insures permanent occupancy, whereas "private ownership results in temporary occupancy followed by exhaustion and depopulation."

The meetings devoted to the discussions of marketing problems were especially well attended, and the keen interest manifested made it apparent that this comparatively virgin field of inquiry is attracting wide public attention. The relation of the Government to the problem was expressed by Dean Galloway, of Cornell University, as "primarily one of establishing principles, of educating the public to the full knowledge of economic, ethical, and moral questions involved, of the development of social consciousness, and of establishing and maintaining social justice to the end that all men at all times receive due compensation for the labor of their hands and minds."

Dr. T. N. Carver, of Harvard University, discussed the advisability of collegiate courses in marketing and distribution, and other speakers took up such topics as future trading in grain, the transportation and distribution of perishable products, the marketing of farm mortgage loans, the development of a market news service, the establishment of a practical market system for large cities, and the formation of cooperative organizations by consumers.

The papers on agricultural education consisted quite largely of descriptions of present plans of organization. Dr. A. C. True, of the States Relations Service, reviewed the system of education for the baccalaureate degree in the agricultural colleges of the United States, and subsequently described the extension work under way. President A. M. Soule, of the Georgia College, discussed the extensive work being carried on by that institution in agricultural extension. Some of the national aspects of agricultural education were also taken up by President Waters, who advocated specifically the teaching of agriculture as an informational subject to all school children, both urban and rural.

Prof. José Commallonga y Mena, of the University of Habana, presented a review of the history and status of agricultural education in Cuba, Director Crawley explained the organization and work of the Cuban Experiment Station, and Dr. Alberto Boerger that of the agricultural station of La Estanzuela in Uruguay. It may be of interest to note that the chief difficulties enumerated by Director Crawley were the scarcity of trained Cubans to carry on the work,

and the need of an extension system for bringing the results directly to the farmer. Research in Uruguay, it was stated, has dealt especially with studies of the laws of inheritance of plants and animals, grain breeding and culture, and the adaptation of plants to Uruguayan conditions, and international cooperation in adaptation work was suggested as feasible.

The status of forestry instruction in this country was reviewed by Prof. J. W. Toumey, of the Yale Forest School, who regarded the provision of vocational training of secondary grade and opportunity for demonstration work as more essential at the present time than the further development of advanced technical instruction in forestry. A paper by President K. L. Butterfield, of the Massachusetts College, called attention to the responsibility of the agricultural college through its extension service in the present transition period of American agriculture to correlate the various agencies designed to bring about a more complete organization of agriculture and country life, but insisted that education and not management must be the province of the agricultural college or other institutions in this and related matters.

The meetings of the subsection on meteorology and seismology were presided over by the chief of the U. S. Weather Bureau, and a very full program of papers covering various phases of these subjects was presented. The number of papers which dealt directly or indirectly with applied meteorology, and particularly with meteorology as applied to agriculture, was surprisingly large, and indicated quite clearly a rather general awakening of interest in the study of problems which may be broadly included under the term agricultural meteorology.

Two papers dealt directly with this subject, one by Prof. J. W. Smith entitled Agricultural Meteorology, in which data collected in Ohio as to the critical periods of growth of the staple crops were summarized, and the other by Mr. J. F. Voorhees on climatic control of cropping systems and farm operations, in which the author maintained on the basis of his findings in Tennessee that all successful cropping systems must be based on climatic conditions, and that more knowledge is needed of the relationship between plants and animals on the one side and climatic conditions on the other. A third paper by Dr. J. E. Church, of the Nevada Station, dealt with problems encountered in snow surveying as a basis for estimating the seasonal water supply for irrigation. Other papers considered frost problems and forecasts in relation to fighting forest fires.

The congress was brought to a close by a general session at which thirty-six resolutions which had been offered and considered by the various sections were adopted. These resolutions were designed

to embody the recommendations of the congress, and in a sense represent a concrete result of its deliberations. Several of the resolutions pertained to agricultural science and are of special interest as a reflection of the trend of opinion of the congress.

One of these resolutions recommended that each country should maintain a well organized live stock sanitary service with a corps of executive officers, inspectors, and laboratory workers. These officers would endeavor so to enforce the live stock laws and regulations as to prevent the importation, exportation, or spread within a country of communicable diseases, and would conduct a survey to locate such diseases. Cooperation between the inspection service of the various countries was advocated, both in the exchange of information regarding the presence of disease outbreaks and in methods of control; and conferences between these services at regular intervals to devise means to protect the live-stock industry were suggested. Some progress already made along these lines was reported from several of the South American countries.

The convening at an early date of an American plant protection conference was recommended in another resolution, with a membership of technical experts. The topics suggested for such a conference included the formulation of necessary legislation, means of establishing competent scientific bureaus, and the undertaking of cooperation in research work and the control of plant introduction. Plans are already being perfected to work out a scheme of international cooperation along some of these lines.

The question of the reclamation of arid lands was declared to be deserving of immediate consideration by the respective nations. It was recommended that each country designate a commission to study existing laws affecting the use of water, the adjudicating of water rights, methods of conservation, and the use of water for irrigation purposes. A cooperative study by governmental agencies of forest conditions and forest utilization was likewise recommended.

A resolution adopted by the previous congress favoring the institution of organized meteorological work to serve as a basis for the establishment of a Pan American meteorological service was reaffirmed. The hope was expressed that the nations not yet providing such a service would establish it at an early date.

The wider distribution of publications and other information regarding the agricultural production of the several countries was favored. Among the means to this end suggested was the establishment, in connection with the Pan American Union or other institution, of a department which, among other duties, could unite the various specialized organizations of the respective nations into appropriate groups, facilitate the interchange of ideas and information among

teachers and others, promote in each country the scientific study of educational problems, and aid in the publication of a series of volumes, to be known as the Pan American Library and to popularize in the various languages the scientific and other work of American authors. A plan for the interchange among the several nations of instructors and students was also advocated.

The full results accruing from a congress of this sort are not easily estimated, and are by no means confined to the papers presented. The promotion of a better understanding of conditions and the quickening of interest in matters pertaining to the several countries is in itself an important result. The establishment of a closer relationship among officials working to a common end or those engaged in what may be termed intersecting lines of work, such as the enforcement of quarantine regulations, may be cited as having many permanent and concrete advantages. In the present case this object is especially important in view of the limited opportunities hitherto available.

The length of the present congress and the marked attention given to social occasions facilitated the promotion of acquaintance and provided bonds of intercourse which should prove useful in future. There should also be mentioned the stimulus and encouragement to those at work in the various lines by the official recognition accorded scientific work. The various resolutions which were adopted present opportunities for utilizing the acquaintance and stimulus developed along specific lines, many of which would be of much service to agriculture if the plans can be brought to fruition. The decision to hold the next session of the congress in Lima, Peru, in 1921, should make possible the accomplishment of definite progress in the long interval intervening.

RECENT WORK IN AGRICULTURAL SCIENCE.

AGRICULTURAL CHEMISTRY—AGROTECHNY.

Yearly report in regard to the progress made in agricultural chemistry, edited by T. Dietrich (*Jahresber. Agr. Chem., 3. ser., 16 (1913), pp. XXXI+563*).—A report of the work of 1913 in continuation of that previously noted (E. S. R., 30, p. 309).

Yearly report in regard to the progress of animal chemistry, 1911, 1912, 1913, edited by R. Andreasch and K. Spiro (*Jahresber. Tier-Chem., 41 (1911), pp. 1423; 42 (1912), pp. 1473; 43 (1913), pp. 1714*).—Abstracts of work pertaining to physiological, pathological, and immuno-chemistry, and pharmacology, for the years 1911, 1912, and 1913 are reported, continuing previous work (E. S. R., 28, p. 777).

On the composition of the seeds of Martynia louisiana, E. H. S. Bailey and W. S. Long (*Jour. Indus. and Engin. Chem., 7 (1915), No. 10, pp. 867, 868*).—Brief botanical and cultural notes of this plant, commonly known as unicorn, devil's claws, or elephant's trunk, are given. The seeds of the plant showed the following percentage composition: Moisture, 2.91; protein, 24.41; ether extract, 60.63; starch, 4.55; crude fiber, 3.05; and ash, 3.8. The constants of two samples of the oil were found to be as follows: Refractive index (15.5° C.), 1.476 and 1.4767; iodin number, 122.3 and 122.8; saponification number, 197.1 and 198.6; and specific gravity (15.5°), 0.9157.

Compared to other edible oils it has an iodin number between that of sesame and poppy oil and much higher than the ordinary oils. Its specific gravity is similar to that of olive oil and mustard oil. Its saponification number is also high, being near that of poppy oil. The oil is readily hydrogenated and a bland product with an iodin number of 72.8 is produced, with which feeding experiments with mice are in progress. The press cake is considered a promising stock food.

The carbohydrates and the enzyms of the soy bean, J. P. Street and E. M. Bailey (*Jour. Indus. and Engin. Chem., 7 (1915), No. 10, pp. 853–858*).—A quantitative separation of the carbohydrates of the soy bean was undertaken in view of the use of the flour for diabetics. "The scheme of analysis in brief was to treat the finely ground meal successively with boiling 95 per cent alcohol, cold water, malt extract, 1 per cent hydrochloric acid, and 1.25 per cent sodium hydroxid, and to determine the kind and amount of carbohydrate removed by each of these solvents."

The beans selected for the investigation were the Hollybrook variety, and contained (in percentage): Water, 12.67; protein, 36.69; ether extract, 14.92; nitrogen-free extract and fiber, 31.08; and ash, 4.64. The nitrogen-free extract comprised the following (in percentage): Galactan, 4.86; pentosan, 4.94; organic acids (as citric), 1.44; invert sugar, 0.07; sucrose, 3.31; raffinose, 1.13; starch, 0.5; cellulose, 3.29; undetermined hemicelluloses, 0.04; dextrin, 3.14; waxes, color principles, tannins, etc. (by difference), 8.6. Only the sugars, starch, and dextrin, comprising 8.15 per cent of the meal, are forms of carbohydrate generally considered objectionable in a strict diabetic diet.

The analyses of 7 commercial soy-bean flours averaged: Water, 5.1; protein, 42.5; fat, 19.9; nitrogen-free extract, 24.3; fiber, 3.7; and ash, 4.5 per cent. Analyses of 19 samples of soy beans are also reported.

From the work on the enzyms of the soy bean the authors conclude that "in addition to the urease, amylase, and glucosid-splitting enzym reported by other workers, the soy bean contains also a protease of the peptoclastic type, a peroxidase, and a lipase. Negative results have been obtained for sucrase and protease of the peptonizing type. It was thought unnecessary to examine the material for urease, and no attempt was made to corroborate the presence of the glucosid-splitting enzym. The presence of an active amylase has been corroborated."

Mucinase in yam, T. Tadokoro (*Trans. Sapporo Nat. Hist. Soc., 5 (1915), No. 3, pp. 193–197, figs. 2*).—The author has found a mucin-coagulating enzym or mucinase in the tubers of the yam (*Dioscorea batatas*) which he has distinguished from chymase, the milk-coagulating enzym. The presence of calcium chlorid was found to accelerate the action of the enzym. This acceleration was perceived in 0.00001 normal concentration and a distinct increase was observable in 0.001 normal concentration. This accelerating action was clearly distinguished from the coagulating power of calcium chlorid. Acetic acid had no accelerating power on the enzym action and the coagulations by acid and enzym were found to be clearly distinct.

Catalysis, II, Gertrud Woker (*Die Katalyse. Stuttgart: F. Enke, 1915, Spez. Teil, 1. Abt., pp. XXII+789*).—A continuation of the work previously noted (E. S. R., 29, p. 504). The use and methods of catalytic agents in analytical chemistry are fully taken up. Numerous references to original work are made. A complete subject and author index is included.

Arsenious oxid as an alkalimetric standard, A. W. C. Menzies and F. N. McCarthy (*Jour. Amer. Chem. Soc., 37 (1915), No. 9, pp. 2021–2024*).—The authors conclude that arsenious oxid is a desirable substance for use as a primary standard in volumetric analysis, and that it can be employed without too complicated manipulation for this purpose in alkalimetry. The comparison of the titer of alkali, as standardized by this and other methods, indicated that concordant results could be obtained by using benzoic acid, hydrochloric acid (factor from constant boiling pressure), hydrochloric acid (factor from silver chlorid determination), and arsenic acid (E. S. R., 28, p. 410).

Portable titrating table, R. E. Ozias (*Jour. Indus. and Engin. Chem., 7 (1915), No. 10, pp. 872, 873, figs. 2*).—A portable titrating table arranged for 8 solutions is described and illustrated by a photograph. The burettes are operated by compressed air supplied by a Goodyear air bottle which rests on a shelf attached to the table. The cost of air per annum in operating the table is estimated at not over 50 cts.

The determination of organic compounds, L. Rosenthaler (*Der Nachweis organischer Verbindungen. Stuttgart: F. Enke, 1914, pp. XVIII+1070, pl. 1, figs. 3*).—A comprehensive reference work for the qualitative determination of organic compounds. Numerous references to original articles on the subject are made. A complete index, giving the name, page of reference, formula, molecular weight, and percentage composition of the compound is included. An author index is also appended.

Effect of free fatty acids upon the flash and fire points of animal fats and oils, A. Lowenstein and J. J. Vollertsen (*Jour. Indus. and Engin. Chem., 7 (1915), No. 10, p. 850*).—By experimental data submitted the authors show that the presence of free fatty acids depresses the flash and fire points of animal fats and oils, the amount of depression varying with the amount of free fatty acid present. The flash and fire tests of the original samples were made

by means of the Cleveland open-fire tester and compared with the neutral glycerids and total fatty acids of the fats and oils. The methods used for preparing the neutral glycerids and total fatty acids are described.

A new apparatus for fat extraction, I. SELECTER (*Jour. Indus. and Engin. Chem., 7 (1915), No. 10, pp. 871, 872, fig. 1*).—The apparatus, which consists in the main of three parts, (1) a condensing section, (2) a flooding section, and (3) a reservoir, is described in detail and illustrated by a figure. Instead of soaking the sample in the liquid ether, or other solvent, as is done in most of the apparatus now in use, it is saturated with the vapor and periodically flooded with redistilled liquid. In testing the apparatus with 10 samples of commercial feeding stuffs it was found to give better extraction than either the straight extraction or the Soxhlet methods. The apparatus is easy to manipulate, presenting a smooth outer surface, which reduces the danger of breakage to a minimum. The recovery of the solvent is also easy and rapid and entails no loss of time.

The estimation of raffinose by enzymotic hydrolysis, C. S. HUDSON and T. S. HARDING (*Jour. Amer. Chem. Soc., 37 (1915), No. 9, pp. 2193–2198*).—A method which depends on the polariscopic measurements of the solution before and after treatment with melibiase has been devised, as follows:

"The solution in which raffinose is to be estimated is first clarified with neutral lead acetate and the excess of the lead removed as oxalate or sulphate. The solution should not contain more than 13 per cent sugars, as a higher concentration tends to retard the enzymotic hydrolysis. It must be also slightly acid, but any free acid is to be avoided, so it is recommended that the solution be accurately neutralized and then made slightly acid with from 1 to 2 drops of acetic acid per 100 cc. of solution. To 95 cc. of the sugar solution 5 cc. of top yeast invertase solution is added, a few cubic centimeters of toluene shaken with the mixture to prevent growth of micro-organisms, and allowed to stand at room temperature until the rotation becomes constant. From 12 to 24 hours are usually necessary, depending on the activity of the enzym solution. In the solution at this stage all sucrose has been inverted and all raffinose has been hydrolyzed to melibiose and fructose by the invertase.

"The next step consists in hydrolyzing the melibiose with melibiase and measuring accurately the accompanying change in rotation. The rotation of the solution should be accurately determined, and since it may now contain considerable fructose its temperature must be carefully controlled for the polariscopic observation. It is recommended that all readings be made at 20° C. . . . There is now added to 95 cc. of the solution which has been hydrolyzed by invertase, 5 cc. of bottom yeast extract . . . and the rotation is read immediately after mixing. It should correspond to the rotation that may be calculated from those of the bottom yeast extract and the solution to which it was added, since the reading is made before there has been sufficient time for the hydrolysis of melibiose to proceed to a measurable extent. The solution should be preserved with toluene, kept at room temperature, and its reading measured from day to day.

"A change of rotation in the levo direction indicates the hydrolysis of melibiose. The specific rotation of this sugar is +143° and . . . changes to +70.4° on hydrolysis. If the solutions are read in a 200-mm. tube in a saccharimeter, a solution containing 1 gm. of melibiose per 100 cc. will change in rotation during hydrolysis 4.18° Ventzke . . . Each degree Ventzke change of rotation indicates, therefore, 0.239 gm. melibiose per 100 cc. in the solution as finally constituted, a value which corresponds to 0.352 gm. anhydrous raffinose."

Experimental data comparing the method with that of Creydt[a] are submitted. Other data show that the method is quite accurate in the presence of sucrose and glucose, fructose, invert sugar, lactose, maltose, cellulose, and trehalose.

A comparison of the methods for the determination of ammonia in soil, B. K. TARASOV (*Zhur. Opytn. Agron.* (*Russ. Jour. Expt. Landw.*), *15* (*1914*), *No. 2, pp. 118–138*).—A comparison of the methods of Boussinghalt, Schlösing, and Prianischnikov for the determination of ammonia in soil (E. S. R., 28, p. 111; 30, p. 215) has led to the following conclusions:

The method of Boussinghalt usually gives results which are too high; undoubtedly since the magnesium oxid acts on the nitrogenous substances of the soil and liberates ammonia. In the method of Schlösing complete removal of the ammonia is only obtained by repeated extractions with hydrochloric acid solution. The action of the hydrochloric acid causes a hydrolysis of the nitrogenous material in the soil which, on heating with magnesium oxid, liberates ammonia, the amount liberated depending on the time of action and also on the strength of the hydrochloric acid. The method of Prianischnikov gives more ammonia than that of Schlösing with soils rich in humus; with loamy soils the reverse is true. The results obtained indicate that as yet there is no reliable method for the determination of ammonia in soils.

The determination of phosphoric acid in vegetable material and in phosphates, A. STUTZER and W. HAUPT (*Jour. Landw.*, *63* (*1915*), *No. 1, pp. 46–49*).—After having experienced some difficulty with the Lorenz method (E. S. R., 13, p. 14) for the determination of phosphoric acid, the authors adopted the following procedure:

Two gm. of the dried material was heated in a Kjeldahl flask with 25 cc. concentrated sulphuric acid and a few drops of mercury until the mixture became colorless. The liquid was then diluted and after cooling transferred to a 500 cc. Erlenmeyer flask. Solid ammonium carbonate was added to neutralize the acid, and when it began to dissolve with difficulty a concentrated solution of ammonium carbonate was added until the liquid was neutral or only slightly alkaline, as indicated by Congo red or other suitable indicator. The liquid was then made acid with concentrated nitric acid, filtered if necessary, and heated to incipient boiling. After careful stirring 100 cc. of molybdic acid solution was added.

The precipitate could be filtered after about two hours' standing, using a weighed, perforated crucible, fitted with an asbestos mat. The precipitate was washed with dilute nitric acid or a solution of ammonium nitrate and finally with strong alcohol to remove the water. The crucible and contents were then dried at from 130 to 140° C., and gently ignited over the Bunsen flame until the precipitate became bluish-green in color. After cooling the residue was weighed as molybdic-phosphoric acid anhydrid ($24MoO_3.P_2O_5$), the factor for calculating as phosphorus pentoxid being 0.03946.

The same procedure was used in phosphate analysis.

The iron-citrate method for the determination of citric-acid-soluble phosphoric acid in Thomas slag, M. POPP (*Die Eisenzitrat-Methode zur Bestimmung der zitronensäurelöslichen Phosphorsäure in Thomasmehlen. Berlin: Paul Parey, 1915, pp. 29, figs. 5*).—The author considers briefly the theory and history of the iron-citrate method (E. S. R., 32, p. 611).

In earlier work (E. S. R., 29, p. 409) on the original method of Böttcher and Wagner, who applied it to Thomas slag, it was found that the ammonium-magnesium-phosphate precipitate was contaminated with silicic acid, which caused high results. This difficulty was overcome in two ways: (1) Evaporation

[a] Ztschr. Ver. Rübenz. Ind., 37 (1887), pp. 153–180.

to dryness of the citric-acid extract with hydrochloric acid, and (2) boiling the extract with sulphuric and nitric acids. The first method was found to be preferable, but the manipulation was not easy and in inexperienced hands led to erroneous results. It was later shown by other investigators that the silicic acid was only precipitated when the slag was poor in soluble iron. Through this soluble iron, which acted as a protective colloid, the silicon dioxid was held in solution in the ammoniacal liquid. In the absence of soluble iron even traces of silicic acid were found to be objectionable.

In devising a new method salts of chromium, zinc, aluminum, nickel, cobalt, copper, mercury, and lead were tried, but not found to prevent the precipitation of the silicic acid. Ferric chlorid, ferric ammonium sulphate, ferrous ammonium sulphate, ferric nitrate, ferric carbonate, potassium ferrocyanid, and potassium ferricyanid were also tried, and it was found that only the presence of the iron ion was necessary, the acid ion used having no effect on the desired result. The outline of the improved citrate method follows:

Five gm. of Thomas slag is treated in a half-liter Stohman flask with 5 cc. of alcohol to prevent caking on the bottom of the flask. The flask is filled to the mark at 17.5° C. with a 2 per cent solution of citric acid and shaken for one-half hour in a mechanical shaker. The solution is then filtered, 50 cc. of the clear filtrate treated with 25 cc. of the iron citrate solution, to which is added 1 cc. of a 3 per cent solution of hydrogen peroxid and 25 cc. of magnesia mixture, the liquid stirred for one-half hour and the precipitate filtered, ignited, and weighed. The author gives in detail the procedure for the preparation and testing of the reagents necessary in working the method, and discusses the details and possible sources of error of the method. A table for converting grams of magnesium pyrophosphate to percentages of phosphorus pentoxid is appended.

Studies on the estimation of inorganic phosphorus in plant and animal substances, E. B. FORBES, F. M. BEEGLE, and A. F. D. WUSSOW (*Ohio Sta. Tech. Bul. 8 (1915), pp. 3–48*).—As previously noted (E. S. R., 23, p. 303) the senior author and associates outlined two different methods for the estimation of inorganic phosphorus, one for use with plant products and the other for materials of animal origin. The investigation on improvements of the methods has been continued for a period of three years, and the results are here reported.

The improved procedure for the determination of inorganic phosphorus in vegetable substances is as follows:

"Pour exactly 300 cc. of 0.2 per cent hydrochloric acid (4.6 cc. concentrated hydrochloric acid, sp. gr. 1.18 to 1.19, per liter) onto 10 gm. of sample in a dry 400-cc. Florence flask. Close with rubber stopper and shake at intervals of 5 minutes for 3 hours. Filter the extract by suction into dry flasks through S. and S. No. 589 'Blue Ribbon' papers, in a Witt filtering apparatus, or a Büchner funnel.

"Measure out a 250-cc. portion of this filtered extract and precipitate in a 400-cc. beaker with 10 cc. magnesia mixture and 20 cc. ammonia, sp. gr. 0.9. Allow to stand over night and filter through double S. and S. No. 589 'White Ribbon' papers, taking care to decant as long as possible without pouring out the precipitate. Then complete the transfer of the precipitate to the paper.

"Wash three times with 2.5 per cent ammonia and then three times with 95 per cent alcohol. Allow the precipitate to drain, and then spread out the inner paper on the top of the funnel, and allow the alcohol to evaporate. When practically dry place this inner paper with the precipitate into an Erlenmeyer flask. Add 100 cc. of 95 per cent alcohol containing 0.2 per cent of nitric acid. Close the flask with a rubber stopper and shake vigorously until the paper is thoroughly broken up. If the precipitate is flaky and refuses to break up on shaking, allow to stand in the acid-alcohol over night.

"Now filter through a dry filter into a dry flask. Pipette out 75 cc. of the filtrate into a small beaker and evaporate almost but not quite to dryness. Dissolve in dilute nitric acid and filter if necessary; then determine phosphorus in the usual gravimetric way, by precipitation first with acid molybdate solution, later with magnesia mixture, and then burning to the pyrophosphate.

"The result obtained as above represents 6.25 gm. out of the original 10 gm. of material, and so to reduce to 1-gm. basis multiply by 0.16."

Analytical results of the determination of phosphorus in vegetable substances, as alfalfa, bluegrass, dried brewer's grains, rice polish, gluten feed, timothy, wheat, and wheat bran, using the above procedure with slight modifications, are submitted.

The method of R. C. Collison (E. S. R., 28, p. 21) was tested by the authors but proved unsatisfactory. Further consideration was given the method as outlined above with special attention to (1) the completeness of extraction, (2) the effect of using large amounts of magnesia mixture in the precipitation, (3) the allowing of more time for the precipitation with magnesia mixture, (4) the facilitating of filtration by the use of the centrifuge, and (5) the use of mechanical means to break up the precipitate in acid-alcohol to insure complete solution of the phosphate. Tabular data are given showing the results of these tests. The authors draw the following conclusions from their work on inorganic phosphorus estimation in vegetable substances:

"A 3-hour extraction with 0.2 per cent hydrochloric acid in water appears to accomplish practically complete solution of the inorganic phosphates of finely ground vegetable substances, but in the case of wheat middlings was shown to allow enzymatic hydrolysis of organic phosphorus, with the liberation of inorganic phosphate. The introduction of filter paper pulp into such an extract materially assists in the maintenance of an easily penetrable condition in a magnesia mixture precipitate from the same. It was found possible completely to recover phosphates from filter paper pulp alone as used in this work.

"The use of the centrifuge very greatly facilitates the filtration of dilute aqueous-acid extracts of vegetable substances.

"There has appeared no reason to doubt the completeness of the precipitation of the inorganic phosphates from the 0.2 per cent hydrochloric acid solution, through the use of magnesia mixture and ammonia.

"The separation of the inorganic phosphates from the phytin and other constituents of the magnesia mixture precipitate, through the agency of 0.2 per cent nitric acid in 95 per cent alcohol, is attended by difficulties which have not yet been overcome. That these difficulties are largely physical, as determined by the bulky and often gummy nature of the magnesia mixture precipitate, seems to be a fact. That they are in part of a chemical nature, and due to the cleavage of phytin or other organic phosphorus compounds of the magnesia mixture precipitate through the agency of enzyms, appears also to be true.

"The use of phenol (50 gm. per liter) in the extractive reagent was shown not to affect the precipitation and estimation of phosphates in pure solutions. In the estimation of inorganic phosphorus in extracts of vegetable substances the presence of phenol appeared to favor the recovery of added phosphates. Phenol, when used in this way, sometimes increased but more commonly decreased the inorganic phosphorus. In extracts of certain vegetable products the presence of phenol increased the difficulty, rather commonly experienced, in breaking up the magnesia mixture precipitate in acid alcohol.

"Modification of the acid-alcohol method of Forbes and associates by the introduction of filter paper pulp into the extract from which the phosphates are to be precipitated, the use of excessive amounts of magnesia mixture in this

first precipitation, and allowing unusual duration of time for this precipitation gave apparently perfect results, as judged by recovery of added phosphates, in certain cases, but unsatisfactory results in others. Incompleteness of recovery of added phosphates was shown not to be due to retention of phosphates by the solid substance of the sample. We are unable to recommend this method, or any other, as reliable for the estimation of inorganic phosphorus in vegetable substances generally.

"The acid-alcohol extraction of the method of R. C. Collison is either incomplete in 3 hours or else causes a cleavage of organic compounds of phosphorus with the liberation of inorganic phosphate."

The studies on the estimation of water-soluble inorganic phosphorus in animal substances were in the nature of comparisons of the neutral molybdate method of Emmett and Grindley, the barium chlorid method of Siegfried and Singewald, and the magnesia mixture method of Forbes and associates. Experimental data presented showed that the methods usually checked by the recovery of known amounts of added phosphate. Outlines for the preparation of cold water extract of desiccated flesh for the determination of inorganic phosphorus, and of hot water-ammonium sulphate extracts of blood, liver, and brain are given in detail, as well as tabular data on the determination of inorganic phosphorus in muscle, blood, and brain.

The authors' conclusions from their work done in 1914 follows:

"The magnesia mixture method gives satisfactorily agreeing results on blood, brain, liver, and flesh, with a recovery of 96 to 100 per cent of added phosphates.

"Neither ammonium sulphate nor boiling and ammonium sulphate together, as used in the magnesia mixture method, were found to cause a splitting off of inorganic from organic phosphorus in blood.

"The use of heat and ammonium sulphate, as in the magnesia mixture method, gives lower results than are obtained without heat and ammonium sulphate, though the recovery of added phosphates is perfect; and evidence was obtained that these lower results were due not to inclusion of phosphates in the coagulum obtained by the use of heat and ammonium sulphate, but to the precipitatin of water-soluble organic phosphorus compounds which, without the use of heat and ammonium sulphate, yield up their phosphorus as inorganic phosphate, under the influence of the nitric acid used in the subsequent steps of the inorganic phosphorus estimation.

"It was found advisable to wash the coagulum with 3.33 per cent ammonium sulphate rather than with hot water. A more concentrated solution was shown not to be necessary.

"In the case of blood, the filtration of the extract through paper was found preferable to the filtration through sand on linen, which is necessary in the case of brain."

The calculation of the specific gravity of milk, O. von Sobbe (*Molk. Ztg.* [*Hildesheim*], *28* (*1914*), *No. 32, p. 602; abs. in Zentbl. Agr. Chem., 44* (*1915*), *No. 1, pp. 52*).—The specific gravity of curdled milk is determined with difficulty and only after treating the milk with ammonium hydroxid. This entails the use of formulas in which the quantity and specific gravity of the ammonium hydroxid used must be known, and also the quantity of milk used. The author has therefore estimated the specific gravity of curdled milk by means of the formula of Mayerhofer-Hoybergsche for the determination of solids other than fat, rearranging it as follows: $S'=4\times r-f$, where S'=specific gravity, r=solids other than fat, and f= the fat content. By determining the fat and the solids-not-fat the specific gravity can thus be easily calculated.

Methods for the examination of bituminous road materials, P. Hubbard and C. S. Reeve (*U. S. Dept. Agr. Bul. 314* (*1915*), *pp. 48, figs. 20*).—This is a revision of Office of Public Roads Bulletin 38 (E. S. R., 25, p. 810). "Since the publication of Bulletin 38 considerable progress has been made in the standardization of methods of examining bituminous road materials. . . . Special attention is called to modifications in the penetration test, determination of fixed carbon, and determination of paraffin scale; and to the substitution of new methods for the old distillation tests and for determination of voids in the mineral aggregate. In addition descriptions of the following methods are given: (1) Determination of flash and burning points, open-cup method, (2) dimethyl sulphate test, and (3) methods of examining bituminous emulsions."

Acid ratio; a new method for determining the proteolytic strength of germinated grain in technical analysis, C. A. Nowak (*Jour. Indus. and Engin. Chem.*, *7* (*1915*), *No. 10, pp. 858, 859*).—A new method, based on the Sørensen formaldehyde titration procedure (E. S. R., 19, p. 808), is described in detail.

The final results are not expressed in absolute amounts of nitrogen present but simply in comparative titrations of the malt extracts. "For brewing purposes a malt having the greatest amount of amino groups is to be preferred, but only provided the original acidity has been fairly high and the relation or ratio between the formol acidity and the natural acidity, obtained by dividing the number of cubic centimeters representing the amino acids by the number of cubic centimeters representing the natural acidity, is as 1:1 or greater."

This ratio, which the author designates the "acid ratio of malt," is an entirely new factor in malt valuation. An advantage in simplicity and rapidity over earlier methods is claimed. A further advantage is that one single determination suffices for the estimation both of the preformed amino acids present in the malt and also the proteolytic strength.

Alcoholic fermentation, A. Harden (*London and New York: Longmans, Green, and Co., 1914, 2. ed., pp. VII+156, figs. 8*).—A second edition of the monograph previously noted (E. S. R., 29, p. 714). No change has been made in the scope of the work, but many additions to the text and a considerable increase in the bibliography have become necessary on account of the rapid progress in the subject.

The recovery of ammonia as a by-product of the sugar industry, E. Donath (*Zentbl. Kunstdünger Indus.*, *20* (*1915*), *No. 15, pp. 187–189*).—Earlier work on the ammonia content of the pressed juice of sugar beets is reviewed. The author found the ammonia content of pressed juices to be greater than that reported by previous investigators, due probably to differences in the procedure of the determinations. Proposed methods and possibilities for such a recovery due to the lack of nitrogenous fertilizing materials are discussed.

Zacaton as a paper-making material, C. J. Brand and J. L. Merrill (*U. S. Dept. Agr. Bul. 309* (*1915*), *pp. 27, figs. 13*).—Experiments are reported which indicate that zacaton grass (*Epicampes macroura*) may prove to be a valuable paper stock in the future. The grass can be chemically reduced to paper stock by the soda process under less drastic and less expensive conditions than those employed for the reduction of poplar wood. Processes, methods, and machinery employed by the manufacturer of pulp from poplar wood were found entirely suitable for the treatment of this material. The yield of air dry fiber from the air-dry grass averaged 43 per cent. Paper manufactured from this stock showed physical tests equal to those of first-grade, machine-finish printing paper.

A botanical description and cultural notes on zacaton are also given.

METEOROLOGY.

The organization of the Meteorological Office in London with special reference to agricultural meteorology, W. N. SHAW (*Ann. Rpt. Met. Com.* [*Gt. Brit.*], *10* (*1915*), *pp. 65–74; abs. in Internat. Inst. Agr.* [*Rome*], *Mo. Bul. Agr. Intel. and Plant Diseases, 6* (*1915*), *No. 6, pp. 789, 790*).—The scope of the work of the British Meteorological Office is briefly outlined, and it is explained that the office collects and digests meteorological information which the agriculturist can apply if he wishes. To this end it issues a daily weather report and provides for the telegraphing of forecasts to those who are willing to pay for the telegrams. These forecasts are prepared throughout the year, thrice daily during the harvest season (June to September) and twice daily throughout the remainder of the year. Weekly and monthly weather reports are also issued. In actual practice these sources of information are very little used by the farmers. At present the formal responsibility of the office is limited to preparing forecasts and compiling statistics which will be indispensable when further investigation has so far developed the laws of weather as to allow of forecasting coming seasons.

By watching the trend of inquiry about the weather upon the part of the general public the office hopes to approach the subject of agricultural meteorology on lines suggested by the agriculturists themselves. It is held that "the further development of the application of meteorology to agriculture is largely dependent upon education in the rural schools," where the study of weather is now becoming a part of the regular course of instruction.

The practical value of long-period rainfall observations, J. B. BENNETT (*Jour. Scot. Met. Soc., 3. ser., 16* (*1914*), *No. 31, pp. 320–328*).—This article emphasizes the importance of long-period rainfall observations, particularly from the standpoint of the engineer.

Precipitation and yield of crops, E. KRÜGER (*Deut. Landw. Presse, 42* (*1915*), *No. 47, pp. 420, 421, figs. 4*).—An attempt is made in this article to correlate summer and winter rainfall with the yields of summer and winter wheat, rye, oats, barley, beets, and potatoes. No clear relation is shown between the winter rainfall and the yields of any of the crops, but the yields were clearly influenced by the amount and distribution of the summer rainfall.

The relation of rainfall to the depth of water in a well, J. SMITH (*Jour. Scot. Met. Soc., 3. ser., 16* (*1914*), *No. 31, pp. 329–335, figs. 2*).—The annual fluctuation of water level in a well is correlated with the rainfall, showing a fairly constant fall from spring maximum to autumn minimum. "A minimum toward the end of the year may be looked for without fail, though in a prolonged drought it may not occur until early in the following year. There is never any serious check in the autumn rise of the water level, and once this rise sets in quite moderate rainfalls are sufficient to insure a steady recovery from the minimum."

Approximate correlation of the influence of climate on the degree and increase of temperature with the depth in the soil, J. BOUSSINESQ (*Compt. Rend. Acad. Sci.* [*Paris*], *160* (*1915*), *No. 24, pp. 747–750; abs. in Rev. Sci.* [*Paris*], *53* (*1915*), *I–II, No. 13, p. 285*).—The conclusion is reached that variations in climate exert very little influence on the rapidity of the rate of increase of the temperature of the earth with the distance from the surface.

The theory and practice of frost fighting, A. MCADIE (*Sci. Mo., 1* (*1915*), *No. 3, pp. 292–301, figs. 9*).—This article explains the processes which facilitate the lowering of the temperature close to the ground, and discusses the efficiency of the various methods which have been used to interfere with or prevent these processes.

It is shown that air gains and loses heat chiefly by convection. The plant gains heat by convection and radiation, and perhaps by conduction of an internal rather than surface character. The soil gains and loses heat chiefly by radiation. Frosts are generally preceded by a loss of heat from the lower air strata, due to convection, and a horizontal translation of the air followed by an equally rapid and great loss of heat by free radiation. There are various other minor changes which affect the process, but the most important factor is the actual transference of the air and vapor and the removal of the latter as an absorber and retainer of heat.

The methods of frost fighting discussed are (1) the use of protective coverings, including not only cloth, straw, and the like but also smudges; (2) the direct application of heat by means of such appliances as the improved orchard heaters used successfully in orange groves; (3) mixing the air and thus getting the benefit of the warmer air at the higher levels; and (4) spraying or irrigating, or using sand, as is done in the case of cranberry bogs. The second method is the one which has proved most successful for large scale operations.

The author concludes that "there is no valid reason, in the light of what has been already accomplished, why at critical periods which may be anticipated the needed volume of surface air may not be sufficiently warmed and the losses which have heretofore been considered inevitable be prevented."

The temperature and precipitation of British Columbia, A. J. Connor (*Ottawa: The Meteorological Service of Canada, 1915, pp. 90, pls. 4*).—This is the first of a series of booklets in which "all the data arising from meteorological observations in Canada during the last seventy years or more will be analyzed and published in synoptical form with comment."

The weather of the year 1912 in Hertfordshire, J. Hopkinson (*Trans. Hertfordshire Nat. Hist. Soc., 15 (1915), No. 4, pp. 225–238*).—This is a report based upon a continuation of long-period observations on temperature, precipitation, and general weather conditions at Watford, St. Albans, and other stations in Hertfordshire. The principal data are tabulated and the general weather conditions for each month of the year are described.

The weather of the year 1913 in Hertfordshire, J. Hopkinson (*Trans. Hertfordshire Nat. Hist. Soc., 15 (1915), No 4, pp. 225–238*).—This is a report of a continuation of long-period observations on temperature and precipitation at various places in Hertfordshire, with notes on the weather of each month of the year.

The climate of Hertfordshire, J. Hopkinson (*Trans. Hertfordshire Nat. Hist. Soc., 15 (1915), No. 4, pp. 195–206, fig. 1*).—A brief account is given of the main climatic characteristics of this region as deduced from rainfall observations covering a period of 70 years (1840 to 1909) and other meteorological observations covering a period of 25 years (1887 to 1911). The stations at which the principal observations were made were Bennington, St. Albans, and Berkhamsted.

The annual rainfall of Scotland and the limits within which it fluctuates, A. Watt (*Jour. Scot. Met. Soc., 3. ser., 16 (1914), No. 31, pp. 312–319*).—The data obtained at 127 stations having unbroken records for 40 years are analyzed. It is shown that "for Scotland as a whole, the average annual rainfall of the driest period of three consecutive years is one-fifth less than the mean annual rainfall."

Rainfall and vapor tension in western and equatorial Africa, R. Chudeau (*Compt. Rend. Acad. Sci. [Paris], 161 (1915), No. 13, pp. 392–395; abs. in Rev. Sci. [Paris], 53 (1915), I–II, No. 20, p. 509*).—The available data on this subject are summarized and discussed.

SOILS—FERTILIZERS.

Soils, their properties and management, T. L. Lyon, E. O. Fippin, and H. O. Buckman (*New York: The Macmillan Co., 1915, pp. XXI+764, pls. 2, figs. 83*).—This book deals more fully and in somewhat different order with essentially the same subjects discussed in a previous book of the Rural Textbook Series (E. S. R., 22, p. 519). Its purpose appears to be to bring the subject matter of the previous book up-to-date and to present in addition the fundamental principles of recently developed phases of the study of soils.

The formation, geological classification, and climatic and geochemical relationships of soils are first discussed. Subsequent sections take up the mechanical, physical, and chemical properties of soils in more or less detail, special reference being made to soil colloids and the absorptive properties of soils. Considerable space is devoted to soil moisture, its control, movement, and utilization, and special sections cover drainage, irrigation, and dry farming. Soil fertility with reference to natural stores of fertilizing constituents in soils and the use of fertilizers and manures is also discussed, mainly from the plant physiological standpoint.

Soil conditions and plant growth, E. J. Russell (*London: Longmans, Green & Co., 1915, 3. ed., rev., pp. VIII+190, figs. 11*).—This represents a revision and third edition of this book (E. S. R., 27, p. 821). A new chapter on the relationship between the micro-organic population of the soil and the growth of plants, and numerous sections dealing with recent developments of other parts of the subject, have been added.

The question of soil mapping, Reuss (*Centbl. Gesam. Forstw., 40 (1914), No. 9–10, pp. 364–369*).—As an improvement over the soil mapping scheme of Graf zu Leiningen (E. S. R., 32, p. 26), it is suggested that a soil map should include geological and petrographic data, data as to the external condition and physical, mechanical, and chemical properties of the soils, and data on soil types with reference to crop adaptabilities. A general scheme for so presenting such data in usable form is briefly outlined.

Field operations of the Bureau of Soils, 1912 (fourteenth report), M. Whitney et al. (*U. S. Dept. Agr., Field Operations Bur. Soils, 1912, pp. 2166, pls. 35, figs. 56, maps 53*).—This report contains a general review of the field operations of the Bureau of Soils during 1912 by the chief of the Bureau, together with detailed accounts of the following surveys:

New London County, Conn., by W. E. McLendon; Orange County, N. Y., by G. A. Crabb and T. M. Morrison; Lehigh County, Pa., by W. T. Carter, jr., and J. A. Kerr; York County, Pa., by J. O. Veatch, L. A. Hurst, and G. B. Maynadier; Reconnoissance Soil Survey of Southeastern Pennsylvania, by C. F. Shaw, J. M. McKee, and W. G. Ross; Ashe County, N. C., by R. B. Hardison and S. O. Perkins; Pender County, N. C., by W. E. Hearn, L. A. Hurst, R. B. Hardison, L. L. Brinkley, and S. O. Perkins; Barnwell County, S. C., by W. T. Carter, jr., R. T. Allen, J. E. Lapham, F. S. Bucher, and J. H. Agee; Chester County, S. C., by W. E. McLendon and G. A. Crabb; Ben Hill County, Ga., by A. L. Higgins and D. D. Long; Chattooga County, Ga., by A. W. Mangum and D. D. Long; Dougherty County, Ga., by M. E. Carr, H. Jennings, T. D. Rice, and D. D. Long; Troup County, Ga., by A. T. Sweet and H. C. Smith; Reconnoissance Soil Survey of Tattnall County, Ga., by H. H. Bennett; The Ocala Area, Fla., by C. N. Mooney, W. J. Latimer, and H. and E. Gunter; Clarke County, Ala., by C. S. Waldrop, L. Cantrell, P. H. Avary, and N. E. Bell; Conecuh County, Ala., by L. Cantrell, R. A. Winston, and F. W. Kolb; Covington County, Ala., by R. T. A. Burke, A. M. O'Neal, jr., W. E. Wilkinson,

N. E. Bell, and J. B. Wilkinson; Lafayette County, Miss., by A. L. Goodman and E. M. Jones; Lincoln County, Miss., by A. L. Goodman and E. M. Jones; Warren County, Miss., by W. E. Tharp and W. M. Spann; Winston County, Miss., by G. A. Crabb and G. B. Hightower; East Feliciana Parish, La., by C. J. Mann and P. O. Wood; Archer County, Tex., by A. E. Taylor, C. Lounsbury, J. O. Veatch, and E. Scott; Harrison County, Tex., by C. Van Duyne and W. C. Byers; Putnam County, Tenn., by C. S. Waldrop; Robertson County, Tenn., by J. H. Agee, L. A. Hurst, H. Jennings, and R. F. Rogers; Christian County, Ky., by R. T. Allen and T. M. Bushnell; Kanawha County, W. Va., by W. J. Latimer and M. W. Beck; Preston County, W. Va., by W. J. Latimer; Reconnoissance Soil Survey of Ohio, by G. N. Coffey, T. D. Rice, et al.; Genesee County, Mich., by B. D. Gilbert; Boone County, Ind., by W. E. Tharp and E. J. Quinn; Hamilton County, Ind., by L. A. Hurst, E. J. Grimes, R. S. Hesler, and H. G. Young; Montgomery County, Ind., by G. B. Jones and C. H. Orahood; Tipton County, Ind., by L. A. Hurst and E. J. Grimes; Will County, Ill., by C. J. Mann and M. Baldwin; Jefferson County, Wis., by W. J. Geib, A. H. Meyer, and O. J. Noer; Barton County, Mo., by H. H. Krusekopf and F. S. Bucher; Carroll County, Mo., by E. S. Vanatta and L. V. Davis; Cass County, Mo., by H. H. Krusekopf and F. S. Bucher; Miller County, Mo., by H. G. Lewis and F. V. Emerson; Pike County, Mo., by A. T. Sweet and E. C. Hall; Stoddard County, Mo., by A. T. Sweet, F. S. Bucher, H. H. Krusekopf, H. G. Lewis, J. E. Dunn, E. C. Hall, and L. V. Davis; Cherokee County, Kans., by P. O. Wood and R. I. Throckmorton; Greenwood County, Kans., by W. C. Byers, N. S. Robb, and J. P. Stack; Jewell County, Kans., by A. E. Kocher, J. P. Stack, E. H. Smies, and R. I. Throckmorton; Otoe County, Nebr., by W. G. Smith and L. T. Skinner; Barnes County, N. Dak., by L. C. Holmes, J. E. Dunn, H. A. Hard, A. C. Anderson, W. Rommel, and A. C. Boucher; Middle Rio Grande Valley Area, N. Mex., by J. W. Nelson, L. C. Holmes, and E. C. Eckmann; Mesilla Valley, N. Mex.-Tex., by J. W. Nelson and L. C. Holmes; Hood River-White Salmon River Area, Oreg.-Wash., by A. T. Strahorn and E. B. Watson; and Fresno Area, Cal., by A. T. Strahorn, J. W. Nelson, L. C. Holmes, and E. C. Eckmann.

During the calendar year 1912, 34,872 square miles, or 22,318,080 acres, were surveyed and mapped in detail, making the total area surveyed and mapped up to the end of that year 284,118 square miles, or 181,835,520 acres. There were also conducted reconnoissance surveys covering an area of 70,224 square miles, or 44,943,360 acres.

Soils of Franklin County, S. C. Jones (*Kentucky Sta. Bul. 195 (1915), pp. 202–235, pl. 1*).—This bulletin, prepared in cooperation with the Kentucky Geological Survey, deals with the general characteristics, chemical composition, and crop adaptabilities of the soils of an area of 200.73 square miles in the so-called Purchase Region of Kentucky. The topography of the county is divided into four phases, namely, flat or undulating valley lands, abrupt cliffs and limestone outcrops, sloping and more or less abrupt hills, and gently rolling table-lands. The county is drained by the Kentucky River and Elkhorn, Benson, and Flat creeks.

The soils are of residual and transported origin, the latter covering 15 per cent of the area. Thirteen soil types are mapped, of which the yellow clay loam residual soil of the hills and bluffs is the most extensive, covering 45.82 per cent of the area. The yellow, brown, and stony loams are also prominent types. Analyses of typical samples of the soils of the area are reported, the results of which are taken to indicate that "the average Franklin County soils are abnormally rich in the mineral elements and, with the exception of the

gray or white silt loam, are only slightly acid. For the average soils nitrogen is decidedly the most limiting element. The chief factors in maintaining the fertility of Franklin County soils consist (1) in preventing soil erosion, (2) in increasing the organic matter and nitrogen content, and (3) in liberating plant food from the large store of mineral elements present in these soils."

The soils of Tennessee, C. A. Mooers (*Resources Tenn., 5 (1915), No. 4, pp. 155–173, pl. 1, figs. 6*).—This report deals briefly with the characteristics, crop adaptabilities, and fertility requirements of the soils of the different natural divisions of Tennessee, the topography of which varies from gently undulating and hilly to mountainous. The upland soils of the State are mainly of residual origin. The prevailing soil types are silt loams and loams, with one large area of fine sandy loam. The subsoils include heavy silt loams, clay loams, and clay. The soils of the central basin of middle Tennessee, covering 5,400 square miles, are practically all of limestone origin and are considered to be the most durable and productive under cultivation of any large area in the State.

The results of analyses and studies of the soils from the different divisions made at the Tennessee Experiment Station are reviewed as a basis for recommendations for fertility and cultural treatment.

[Soil analyses], F. H. Range (*Bol. Dept. Nac. Fomento [Paraguay], No. 7 (1914), pp. 34–37*).—Analyses of 17 samples of tobacco, banana, alfalfa, and pineapple soils are reported.

Soils and agriculture of North Wales, G. W. Robinson (*Jour. Bd. Agr. [London], 22 (1915), No. 3, pp. 216–222*).—It is stated that the soils of North Wales are in general medium loams of comparatively uniform mechanical composition and contain sand and silt in fairly equal proportions. Clay is almost invariably the smallest fraction. The soils usually have a high content of organic matter and chemically are almost always deficient in carbonate of lime, but are relatively well supplied with potash soluble in hydrochloric acid. Considerable areas of waste land occur in the region, consisting of sandy stretches, peat, glacial drift soil, and heather moors. Grass is the predominant feature in the farming of North Wales, and the proportion of arable land is generally less than 30 per cent of the total.

Researches on the concentration of the liquid circulating in Libyan soils, E. Pantanelli (*Bul. Orto Bot. R. Univ. Napoli, 4 (1914), pp. 371–383*).—Experiments to determine the relative concentrations of the soil solutions of oasis, garden, flat plain, hill, cultivated hill, sand dune, desert, and salt marsh soils from Tripoli are reported.

It was found that the concentration of the soil solution in salts was correctly measured by determining the electrolytic conductivity of the liquid percolate of the soil. Dialysis of the soil solution served to separate the colloids. The concentration of the solution of the dune sands was the lowest. The solutions of oasis, garden, and flat plain soils were nearly of the same concentration, which is classed as low. The concentration of the hill soil solution was slightly higher than these, and that of the desert soils and cultivated hill soils still slightly higher. The salt marsh soils contained a highly concentrated solution which was, however, low in colloidal matter. The sandier soils of the desert and hills, while low in crystalline salts, were relatively high in colloidal matter. The concentration of the solution of the oasis sand soils and dune sands increased slightly with the depth, while the opposite was true with the salt soils.

Lithium in soils, L. A. Steinkoenig (*Jour. Indus. and Engin. Chem., 7 (1915), No. 5, pp. 425, 426; abs. in Chem. Abs., 9 (1915), No. 13, p. 1815*).—Determinations of the lithium content of 19 samples of soils taken from six different areas in the United States showed that lithium, although occurring

in small amounts varying from 0.001 to 0.01 per cent in the soil and from 0.002 to 0.007 per cent in the subsoil, was present in all soils examined. The content of lithium did not seem to follow that of any other element in the soil, and nearly the same amounts were found in the soil and subsoil.

Absorption of cations and anions by cultivated soil, A. De Dominicus (*Staz. Sper. Agr. Ital., 47 (1914), No. 7, pp. 449–473; abs. in Chem. Zentbl., 1915, I, No. 8, pp. 391, 392*).—In this article a series of experiments on the absorption of the cations and anions of solutions of different salts by five different soils are reported. The cations tested were those of the chlorids of ammonium, potassium, sodium, calcium, magnesium, aluminum, and iron, and the anions were those of the chlorid, nitrate, sulphate, carbonate, silicate, phosphate, and aluminate of sodium.

It was found that the cations of the salts tested were absorbed without exception by soils, and the anions also in most cases. The degree of absorption increased with the valence of the absorbed ions. The relations of the cation and anion absorption were the same in all soils, but the total absorption varied. Absorption is, therefore, thought to depend on the nature of the soil colloids and of the soil solution.

Behavior of humic acid toward anions, G. I. Ritman (*Iz Rezul't, Veget. Opytov Lab. Rabot, 9 (1913), pp. 441–447*).—In studies of the action of so-called humic acid solutions on salts and acids it was found that the bases of salts were absorbed. No effect was observed on hydrochloric or sulphuric acids. With potassium nitrate a marked decrease in nitrate in the solution was attributed to reduction processes.

Humus and humus-nitrogen in California soil columns, R. H. Loughridge (*Univ. Cal. Pubs., Agr. Sci., 1 (1914), No. 8, pp. 173–274*).—A brief review of several years' analyses of California surface soils is given and investigations are reported, the main purpose of which was to ascertain the extent to which humus is present in the lower depths of California soils. For this purpose 110 soil columns were taken from 37 counties in regions whose soils are many feet in depth, each column representing a characteristic type of land in its particular region.

The soils of California were found to be richer in humus than has been generally supposed, containing in their depth of 3 ft. more than in the soils of humid regions and in the entire columns of 12 ft. or more double that of humid soils. The humus content was usually distributed through depths of 12 or more feet, the highest percentage being in the upper 3 ft. and diminishing downward. The surface soils were found to have an average of 1.28 per cent of humus and the upper 3 ft. of soil proper an average of 1.06 per cent per foot, or a sum of 3.17 per cent.

The tule swamps showed the highest percentage of humus on account of the mass of decaying roots and other vegetable matter, while the desert plains showed the least. Humification was retarded in close, compact adobe clays and the humus content was less than in lighter loam and sandy soils. The soils of the valleys of the coast range in the western part of the State showed higher percentages of humus than any of the other agricultural regions. It was found that the humus of the soils of the State is very generally derived from plant roots instead of from accumulations of vegetable material at various depths during soil formation.

The black color of the soil was not always due to a high humus content, many black soils showing a smaller percentage of humus than soils of a gray color. The average percentage of nitrogen in combination in the humus of the first foot of the soil columns was 5.92, while that of each of the upper 3 ft. was 5.6 per cent and a little less for the entire 12 ft., varying from 1 to 20 per cent

in individual layers. The organic nitrogen in the soil derived from the humus varied from almost nothing in the lower depths of the soil to as much as 0.13 per cent in the upper 3 ft. The average of the first foot of the soil columns was 0.07 per cent, and for each of the 3 upper feet 0.05 per cent.

Phosphoric acid was present in the humus of these soils to the extent of from 0.01 to 0.08 per cent throughout the entire depth to which humus reaches, though usually more so in the upper few feet. The humus content was sometimes less in the first foot than in the second on account of being gradually destroyed by cultivation and summer fallowing. Arid soils are considered to have an immense advantage over those of the humid region on account of this distribution of humus and its nitrogen, as well as of mineral plant food, through a depth of many feet. It is thought that the practical value of California soils can not be based alone upon the nature of the surface and subsoils, but chiefly upon the texture and depth of the soil.

The presence of proteoses and peptones in soils, E. H. Walters (*Jour. Indus. and Engin. Chem., 7 (1915), No. 10, pp. 860–863*).—The general characteristic properties of proteoses and peptones are described, and laboratory experiments with a sandy loam soil are reported. The results are taken to indicate that proteins undergo hydrolytic decompositions in the soil in much the same way as in digestion by enzyms, acids, or alkalis, and that a mixture of the various proteoses and peptones resulting from such decompositions exists and persists in the soil as such for a considerable period.

The effect of certain organic compounds on wheat plants in the soil.—Preliminary paper, F. W. Upson and A. R. Powell (*Jour. Indus. and Engin. Chem., 7 (1915), No. 5, pp. 420–422, fig. 1; abs. in Chem. Abs., 9 (1915), No. 13, p. 1817*).—Experiments at the Nebraska Experiment Station on the behavior of vanillin in concentrations varying from 250 to 1,000 parts per million toward wheat plants in black silt loam, silt loam, and in water cultures showed that vanillin was not appreciably toxic to wheat plants when present in the soil in the highest concentrations used, and was much less toxic in the soil than in water cultures.

Salicylic aldehyde used in concentrations varying from 10 to 500 parts per million was much less toxic to wheat and corn plants in the soil than in water cultures, the toxic effect on wheat at the highest concentration being practically negligible. Further experiments showed, however, that the effect of salicylic aldehyde on wheat and corn is different for different soils.

"Preliminary experiments on the behavior of cumarin, quinone, and dihydroxystearic acid toward wheat plants in the soil indicate that the effect is entirely different from the effect of these substances in water solutions. Quinone in concentrations below 500 parts per million in soil is beneficial to the growth of wheat. The other two substances are somewhat more toxic in the soil than is vanillin."

A bacterial test for plant food accessories (auximones), W. B. Bottomley (*Proc. Roy. Soc. [London], Ser. B, 89 (1915), No. B 610, pp. 102–108*).—In experiments to discover a bacterial test for plant-food accessories in soils (auximones) it was found that when the phosphotungstic acid extract from 1 gm. of bacterized peat is added to a normal nitrifying culture solution inoculated with nitrifying organisms and the whole is incubated at 26° C. a thick scum is formed on the surface of the liquid. Further tests showed that the scum is due to the presence and specific action of the auximone from the bacterized peat.

An examination of the scum showed that it consists of two predominant kinds of organisms, namely, a thin bead rod form and a spindle-shaped form.

When grown separately in a nitrifying solution plus auximone the scum did not appear. Tests of a number of soils, including loams, clays, and gravels, showed that all yielded the scum, the best growth being obtained from a virgin loam. It was found that the rate of growth and thickness of the scum showed a progressive increase with the quantity of auximone present above a certain minimum. Tests of fresh and well-rotted stable manure showed that the quantity of auximone present increases with the progressive decomposition of the organic matter of the manure. Further results brought out by the experiments indicated that the organisms which form the scum require no organic carbon for their growth and are similar to the nitrifying organisms and sulphur and iron bacteria in that they can assimilate atmospheric carbon dioxid by the process of chemosynthesis. They can not live on nitrates, but must obtain their nitrogen from an ammonium salt, and they are not destroyed by heating. See also a previous note (E. S. R., 31, p. 826).

Soil protozoa and soil bacteria, E. J. Russell (*Proc. Roy. Soc. [London], Ser. B, 89 (1915), No. B 610, pp. 76–82*).—The author is of the opinion that the conclusion drawn by Goodey (E. S. R., 33, p. 515) that ciliates, amœbæ, and flagellates can not function as a factor limiting the number of bacteria in soils is not justified by the experimental data reported, and reviews investigations by himself and his associates (E. S. R., 29, p. 122; 32, p. 816; 33, p. 621) in support of his theory.

Soil fatigue and sterilization, D. Zolla (*Rev. Gén. Sci., 26 (1915), No. 4, pp. 116–120*).—The work of others is reviewed to show that soil fatigue is not equivalent to soil exhaustion, and that the cause of soil fatigue can usually be removed by partial sterilization with heat or antiseptics.

The control of soil washing, M. F. Miller (*Missouri Sta. Circ. 78 (1915), pp. 12, figs. 9*).—This circular briefly discusses soil washing by gullying and sheet washing and describes methods of prevention and control, consisting mainly of the use of winter cover crops, deep plowing, contour farming, maintaining the organic matter content in the soil, and the use of straw, bushes, trees, dirt, brush, logs, stumps, dams, and débris for large gullies.

The feeding of farm crops, W. Schneidewind (*Die Ernährung der Landwirtschaftliche Kulturpflanzen. Berlin: Paul Parey, 1915, pp. VIII+487, figs. 16*).—This is a practical treatise, in three parts, for the use of farmers and contains only such experimental results as have a well-defined, practical as well as a scientific value.

The first part, presented as a scientific basis for the third part, deals with the physiology of plant nutrition, both when germinating and during later growth. The second part deals with the soil, describing the rock and mineral constituents forming the earth crust, the physical, chemical, and biological processes of soil formation, and the different soil types and their properties and transformations through human agencies. The third part deals with fertilization, first discussing the different fertilizers and fertilizing materials and their uses, including stable and green manures and artificial fertilizers supplying nitrogen, potash, phosphoric acid, and lime, and, second, describing the peculiarities of individual crops with reference to the kind, form, and amount of fertilization required under different conditions. In this connection plans for crop rotation and field experiments are given. The plans for the fertilization of individual crops in the different rotations and on the different soil types are intended to indicate to the farmer how and to what extent the kind and amount of fertilization for each crop is dependent on the preceding crop and its fertilization.

Plant food and soil bacteria, A. Koch (*Mitt. Deut. Landw. Gesell., 30 (1915), No. 11, pp. 155–158*).—The work of others is briefly reviewed and ex-

periments reported, the purpose being to show that fertilizers, including stable and green manures and artificial manures, serve as sources of nourishment to soil bacteria and thereby exert a favorable influence on their activities in making available to plants the stores of residual and natural plant food in soils.

The conditions of complete action of fertilizers, BECKER (*Fühling's Landw. Ztg., 64 (1915), No. 9–10, pp. 255–261*).—A brief statement enumerating the most important factors influencing the complete utilization of fertilizers in soils by crops, such as moisture, humus, lime, tilth, adaptation to season, etc., is given.

Row fertilizing, TACKE (*Mitt. Deut. Landw. Gesell., 30 (1915), No. 9, pp. 118, 119*).—Row fertilizing of oats and rye on sandy upland moor soils was accompanied by an increase in crop yield in two consecutive years as compared with broadcast application of fertilizers.

Providing Germany with plant food, B. RASSOW (*Ztschr. Angew. Chem., 28 (1915), No. 32, Aufsatzteil, pp. 196–201*).—This is a brief review of the fertilizer situation in Germany.

Vegetation experiments with different nitrogen and phosphoric acid fertilizers, B. SCHULZE (*Illus. Landw. Ztg., 34 (1914), No. 99, pp. 817, 818, figs. 4*).—In pot culture experiments with oats and mustard on a soil deficient in nitrogen it was found that of three nitrogenous fertilizers tested the so-called nitrate-diphosphate, consisting of apatite semidigested with nitric acid, gave the best results, while little difference was observed between sodium nitrate and calcium nitrate containing an excess of lime. On the basis of these results the nitrate-diphosphate is considered to be a valuable nitrogenous fertilizer.

Further tests on the same soil with the same crops using three other nitrogenous fertilizers showed that a mixture of lime nitrogen and raw iron oxid 2:1 gave better results than pure lime nitrogen or lime nitrogen and Thomas slag 1:2. Mixing the lime nitrogen with Thomas slag seemed to decrease the availability of the nitrogen.

In experiments with the same crops on a soil deficient in phosphoric acid, it was found that precipitated superphosphate, containing 30.37 per cent citrate-soluble phosphoric acid, gave the best results, followed in order by superphosphate, Thomas slag and lime nitrogen mixture 2:1, pure Thomas slag, and nitrate-diphosphate.

The nitrogen of processed fertilizers, E. C. LATHROP (*Chem. News, III (1915), Nos. 2887, pp. 145–147; 2888, pp. 162–164; 2889, pp. 169–172; 2890, pp. 186, 187*).—The substance of this article has been noted (E. S. R., 32, p. 217).

How can crops be grown without potash manures next year? E. J. RUSSELL (*Jour. Bd. Agr. [London], 22 (1915), No. 5, pp. 393–406*).—It is stated that the lack of potash may be met by the use of wood ashes, damaged straw, mangold and other leaves, and liquid manure. "These contain considerable quantities of potash which, in the aggregate, would help materially in coping with the present shortage. Moreover, the plowing up of leys and grass land leads to the liberation of the potash stored up in the roots, stems, and leaves, causing it to become available for the next crop." Two agencies suggested for increasing the availability of potash in the soil are (1) sodium salts, especially common salt and sodium sulphate, and (2) lime or chalk. "The former can be used for mangolds and for cereals when necessary. Lime and chalk are more suitable for leguminous crops, clover, etc."

Possible sources of potash, C. G. CRESSWELL (*Jour. Soc. Chem. Indus., 34 (1915), No. 8, pp. 387–393*).—The author discusses chemical and other methods for obtaining potash from sea water, seaweed, ashes, saltpeter, potash lakes

and deposits, feldspar, mica, leucite, alunite, waste liquors from cellulose pulp mills, sugar residues, and wool scourings.

The potash situation, E. Hart (*Jour. Indus. and Engin. Chem., 7 (1915), No. 8, pp. 670, 671*).—Attention is drawn to the possibility of economic potash production from so-called cement fume from cement factories and from refuse heaps from feldspar mining. The economy of the process involved in the latter case depends largely on the simultaneous production of alum.

A preliminary report on the feldspar and mica deposits of Georgia, S. L. Galpin (*Geol. Survey Ga. Bul. 30 (1915), pp. XII+190, pls. 11, figs. 3*).—This report contains data on feldspar and mica deposits of Georgia, including notes on their commercial uses.

It is shown that one class of the feldspars, namely, pegmatite dikes, is of high quality, containing usually about 12 per cent of potash, enough to make it worthy of consideration as a source of potash. Appendixes on (1) abstracts of patents issued by the United States Patent Office on methods for extracting potash and other substances from silicate rocks and minerals, especially feldspar, and (2) ground feldspar as a commercial fertilizer are included.

The displacement of the potash of neutral alumino-silicates by neutral salts, S. Kochergin (*Iz Rezul't. Veget. Opytov Lab. Rabot, 9 (1913), pp. 386–391, figs. 2*).—In tests of the solubility of the potash of different silicates in ammonium acetate it was found that the potash of the so-called potassium zeolite was the most soluble, followed in order by muscovite, nepheline, phonolite, biotite, and orthoclase. The solubility of biotite potash showed an increase for from 2 to 56 days.

The destructive distillation of Pacific coast kelps, D. R. Hoagland (*Jour. Indus. and Engin. Chem., 7 (1915), No. 8, pp. 673, 674*).—The results of comparative laboratory distillations of kelp (*Macrocystis pyrifera*) with oak and fir made at the California Experiment Station to determine some method of utilizing the organic matter of kelp in addition to the potash and iodin led to the conclusion that kelp distillates have no commercial value, but that most of the potash may be easily recovered from the charcoal as a high-grade product. See also a previous report by Burd (E. S. R., 32, p. 723).

Three years' experiments on the effect on the yield of crops of potash works waste products containing magnesium chlorid, A. Stutzer and W. Haupt (*Dreijährige Versuche über die Wirkung von Chlormagnesium enthaltender Endlage von Chlorkaliumfabriken auf die Ernteerträge. Berlin: Paul Parey, 1915, pp. IV+84, figs. 2*).—The work of others bearing on the subject is reviewed and plat experiments with oats, wheat, red beets, sugar beets, barley, and rye on soil rich in lime and with hay on meadow land are reported. The purpose was to determine the effect of irrigating with water containing waste products from potassium chlorid works in amounts varying from the equivalent of 1,500 to 2,500 mg. of chlorin per liter.

It was found on three different meadow soils that the waste products in the highest concentration used had no bad effects on the yield of hay. The same results were obtained with the other crops on the soil rich in lime. The absence of injurious effect of the waste products on these soils is attributed to the presence of sufficient lime in the soils to neutralize any acid products of disassociation of the waste products.

Phosphate rock and methods proposed for its utilization as a fertilizer, W. H. Waggaman and W. H. Fry (*U. S. Dept. Agr. Bul. 312 (1915), pp. 37*).—This bulletin states briefly the origin, extent, and composition of the phosphate deposits of Florida, Tennessee, South Carolina, Arkansas, Kentucky, southeastern Idaho, western Wyoming, northern Utah, and western Montana, and

describes a number of processes for treating phosphate rock in the manufacture of phosphoric acid and phosphatic fertilizers, which are classified as follows:

"(1) Acid treatment, which includes the manufacture of superphosphate and phosphoric acid, (2) combined heating and acid treatment, (3) double decomposition by means of a silicate or an alkali, (4) processes used in connection with the steel industry, (5) processes in which the phosphorus or phosphoric acid is volatilized, (6) treatment dealing with the production of two or more fertilizer elements, (7) electrolysis, (8) enrichment or concentration of phosphates, (9) processes and apparatus for the mechanical treatment of phosphates, and (10) miscellaneous processes."

A classified list of patented processes is appended.

The Elliston phosphate field, Montana, R. W. Stone and C. A. Bonine (*U. S. Geol. Survey Bul. 580 (1915), pp. 373–383, pl. 1*).—The geology of this field is described and it is stated that the phosphate rock is readily distinguished by its finely oolitic texture, thin bluish-white coating on weathered surfaces, heavy specific gravity, and peculiar odor. A map of the field and analytical data indicate that in the north half of the field, covering about 7 square miles, a bed of phosphate rock ranging in thickness from 3 to 5 ft. and averaging approximately 65 per cent in tricalcium phosphate outcrops for 9 miles, which, it is estimated, contains about 70,956,032 tons of phosphate rock. It is estimated that the south half of the field covers about 1.5 square miles and contains, on the basis of an average thickness of 4 ft., 15,204,864 tons of phosphate rock.

Some properties of phosphorites from Sengileï, I. V. Îakushkin and P. I. Krivobokov (*Iz Rezul't. Veget. Opytox Lab. Rabot, 9 (1913), pp. 160–166*).—Studies of the chemical properties of these phosphorites with reference to the availability of their phosphoric acid content to graminaceous plants are reported. The original phosphorites and the weathered and decomposed phosphate mass were studied separately.

It was found that the latter in comparison to the former contained more insoluble residue, more iron and alumina, and considerably less calcium oxid, sulphuric acid, and carbon dioxid. The ammonium citrate extract of the former was colorless and contained only traces of phosphoric acid, while the extract of the latter was highly colored and contained important quantities of phosphoric acid, a little more lime, and considerably more iron than that of the former. Decomposition of the phosphorite frequently was accompanied by the formation of considerable quantities of iron phosphates.

Extraction of phosphoric acid from natural phosphates, I, A. V. Kazakov (*Iz Rezul't. Veget. Opytov Lab. Rabot, 9 (1913), pp. 57–70, figs. 4*).—A review of the literature bearing on the subject and a theoretical chemical discussion of the minimum possible sulphur trioxid and calcium oxid contents of extracts of phosphates are followed by the results of quantitative analysis for sulphur trioxid and calcium oxid of a series of extracts obtained by treatment of ground Viatka phosphates with different amounts of sulphuric acid, the purpose of which was to determine standards for optimum conditions. In this connection the author proposes a rapid method for determining such standards, based on qualitative tests for the presence of phosphates of calcium, aluminum, and iron.

The results show that the method of qualitative tests not only can replace the method of quantitative determination of the calcium oxid and sulphur trioxid but proves the presence or absence of phosphates of calcium, aluminum, and iron in the extract. In drawing this conclusion the author made a comparison of the standards determined empirically with those theoretically determined on the basis of the chemical composition of the Viatka phosphates. The em-

pirical standard was 69.14 gm. of sulphuric acid and the theoretical standard on the basis of tricalcium phosphate was 64,325 gm., and on the basis of apatite 70.424 gm. This is taken to indicate that for the phosphate used the apatite content should be taken as a basis for the establishment of a standard.

A special type of natural phosphate, I. V. ÎAKUSHKIN (*Iz Rezul't. Veget. Opytov Lab. Rabot, 9 (1913), pp. 92–136, figs. 10*).—Further cropping experiments with a special type of natural phosphate (E. S. R., 29, p. 418) are reported.

Tests of the inside and outside parts of this phosphate showed the outer parts to be the most available. This is taken to indicate that a more intensive secondary process is a necessary factor in the accumulation of semisoluble phosphoric-acid compounds in raw phosphates. Samples of a relatively available raw phosphate taken from different depths showed no difference in their behavior toward crops.

The size of the cereal crop when fertilized with raw phosphate was found to depend on the content of phosphoric acid soluble in citric acid. In all cases of apparent deficiency of phosphoric acid in the deeper layers the crops showed a low content of easily soluble phosphoric acid. The transition from deficient to sufficient nourishment of crops was always closely related not only to the significant increase in the harvest but also to the content of easily soluble phosphoric acid compounds in the crops. The percentage of total phosphoric acid, especially of phosphorus combined with protein, decreased in certain cases. Excessive nourishment, while it increased the content of all forms of phosphorus in the crop, did not increase the size of the harvest.

Preparation of enriched superphosphate with precipitated phosphate, K. N. SHVETSOV (*Iz Rezul't. Veget. Opytov Lab. Rabot, 9 (1913), pp. 81–91*).—Studies of the preparation of enriched superphosphate were conducted, the phosphoric acid of a water solution of superphosphate being precipitated and treated with sulphuric acid. With a sample of Viatka phosphate the author succeeded in obtaining a phosphatic precipitate containing from 30 to 40 per cent phosphoric acid and an enriched superphosphate containing from 18.4 to 32.3 per cent total phosphoric acid, of which from 14.4 to 31.8 per cent was soluble in water.

Palmaer's phosphate, D. N. PRIANISHNIKOV and I. V. ÎAKUSHKIN (*Iz Rezul't. Veget. Opytov Lab. Rabot, 9 (1913), pp. 152–159*).—Cropping experiments with oats, millet, and flax to determine the value of Palmaer's phosphate as a fertilizer are reported.

It was found in all cases that this phosphate was well utilized and was superior to all other sources of phosphoric acid used, including superphosphate and Thomas slag. Analyses of the millet crop showed that the phosphoric acid of Palmaer's phosphate was utilized as well as that of monocalcium phosphate, and it was markedly superior to superphosphate for flax. It is thought that Palmaer's phosphate will have a much better effect on sandy soil tending to be acid than superphosphate. In chemical studies the phosphoric acid of Palmaer's phosphate was found to be much more soluble in Petermann's reagent than that of Thomas slag.

Wolter's phosphate and its components, N. A. USPENSKIĬ (*Iz Rezul't. Veget. Opytov Lab. Rabot, 9 (1913), pp. 359–377*).—Experiments to determine the effect of the Wolter process on Kasan phosphorite with reference to the availability of the resulting phosphate are reported. This process involves the fusion of the phosphorite with sodium sulphate, carbon, and calcium carbonate.

The Kasan phosphorite contained 40 per cent calcium oxid and 5 per cent carbon dioxid. A 3-hours' fusion of this phosphorite with sodium sulphate and carbon yielded a product, the phosphoric acid of which was as available to millet in sand cultures as that of Wolter's phosphate or Thomas slag. An ex-

cess of lime in the fusing mixture which formed an unfused residue resulted in the formation of insoluble calcium phosphates, and the phosphoric acid content soluble in Petermann's reagent was decreased. The addition of sand to the fusing mixture had a favorable effect, attributed to the neutralization of injurious excesses of lime and to the possible formation of phosphate of silicon. The mixture of phosphorite, sodium sulphate, and carbon when fused for 1.5 hours showed 21.63 per cent of its phosphoric acid to be soluble in Petermann's reagent, as against 60.68 per cent of that in Wolter's phosphate. After 3-hours' fusion 57.33 per cent of the phosphoric acid of the mixture was available, as against 69.93 per cent of that of Wolter's phosphate.

The influence of temperature in the extraction of Thomas slag with citric acid, W. HOLLE (*Chem. Ztg., 38 (1914), No. 128–129, p. 1155; abs. in Chem. Zentbl., 1914, II, No. 25, p. 1409*).—In three series of experiments using 2 per cent citric acid for 15 minutes at average temperatures of 17.5, 24.5, and 26.5° C. the average difference in phosphoric acid extracted from Thomas slag was 0.034 per cent per degree of difference in temperature.

The assimilation of reverted phosphoric acid by plants, V. P. KOCHETKOV (*Iz Rezul't. Veget. Opytov Lab. Rabot, 9 (1913), pp. 137–147, figs. 5*).—This is a report of the third year's sand-culture experiments with different phosphates (E. S. R., 30, p. 428). The phosphoric-acid fertilizers tested were (1) the residue obtained after evaporation to dryness of a water solution of a phosphate treated with sulphurous acid, (2) the lime precipitate of a solution of Viatka phosphate in sulphurous acid, (3) enriched superphosphate obtained by treatment of precipitated phosphate with sulphuric acid, and (4) nitrosuperphosphates obtained from the waste liquor of trinitro-toluene works.

As in the previous experiments, excellent results were obtained with the superphosphates obtained from the Viatka phosphate and with the nitrosuperphosphates. The second phosphate had a good effect, but the third had a depressing effect on the crop, due, it is thought, to the presence of sulphites.

The action of sulphur on plant production, T. PFEIFFER and W. SIMMERMACHER *Fühling's Landw. Ztg., 64 (1915), No. 9–10, pp. 243–255, fig. 1*).—Previous experiments by Pfeiffer and Blanck (E. S. R., 31, p. 220) and work by a number of others bearing on the subject are briefly reviewed and field experiments with beets are reported. In the latter practically the same results were obtained as with oats in the previous experiments.

These results are taken to indicate that sulphur fertilization is wholly ineffective on the soil used in the experiments. It is concluded that in the light of present knowledge a recommendation for the general use of sulphur as a fertilizer in agricultural practice is not justified.

The fertilizing action of sulphur on vines, D. ZOLLA (*Rev. Gén. Sci., 26 (1915), No. 4, pp. 120, 121*).—Experiments by Chauzit are reported, the results of which showed that sulphur has a more marked effect when used as a fertilizer when the soil is well stocked with organic matter. The effect of the sulphur decreased as the content of organic matter decreased. The action of the sulphur is increased when it is mixed with organic matter and when it is used in large amounts.

Fertilizer experiments with the sulphate and carbonate of manganese, G. D'IPPOLITO (*Staz. Sper. Agr. Ital., 47 (1914), No. 8, pp. 621–626; abs. in Chem. Zentbl., 1915, I, No. 8, p. 392*).—In plat experiments with medicinal herbs and cereals on a natural clay soil to test the fertilizing value of manganese carbonate and sulphate, a marked increase in crop yield was obtained with both compounds. Both are concluded to be valuable catalytic agents in connection with the fertilization of crops.

Radium fertilizer, R. R. RAMSEY (*Science, n. ser., 42 (1915), No. 1076, p. 219*).—On the basis of an estimate that the upper 5-in. layer of an acre of soil

contains 1 mg. of radium, it is pointed out that in previous experiments by Hopkins and Sachs (E. S. R., 32, p. 821) the maximum application of 1 mg. of radium at a cost of $100 per acre only doubled the radium content of the soil. It is further estimated that the amount of radium emanation given off by the soil was from 50 to 100 times as much as that given off by the radium in the upper 5-in. layer, and that 75 mg. of radium per acre, costing $7,500, will be required to double this amount.

The radio-activity of spring water, R. R. RAMSEY (*Amer. Jour. Sci., 4. ser., 40 (1915), No. 237, pp. 309–313*).—Tests of the waters of farm springs and of drilled, driven, and dug wells showed that the radio-activity of 4 Ohio wells varied from 70×10^{-12} curies per liter to 200×10^{-12} curies per liter, of 9 Ohio springs from 100×10^{-12} curies per liter to 610×10^{-12} curies per liter, and of 28 Indiana springs from 77×10^{-12} curies per liter to $2,150\times10^{-12}$ curies per liter. The emanation content of the springs varied with the flow, some of the higher values being obtained from wet weather springs.

Activated sludge in America, W. N. BAKER (*Engin. News, 74 (1915), No. 4, pp. 164–171, figs. 5; abs. in Chem. Abs., 9 (1915), No. 17, p. 2411*).—Tests at several experimental plants of the process of treating sewage by aeration in a tank in the presence of an accumulation of aerated sludge are reported.

The results indicate the possibility of obtaining a high degree of clarification and perhaps bacterial reduction, with a stable effluent and a quick-drying sludge of a high fertilizing value.

The production of peat in 1914, C. A. DAVIS (*U. S. Geol. Survey, Mineral Resources of the United States Calendar Year 1914, pt. 2, pp. 375–385*).—This report describes the formation and occurrence of peat, discusses its various uses, and gives data on production and use in this country and in Europe.

It is stated that the peats of the United States are very rich in combined nitrogen, many of them exceeding 2 per cent and some containing more than 3 per cent of the total dry weight. The most successful peat industry so far attempted in the United States is said to be that of preparing peat for use as a fertilizer or as a fertilizer filler. Black, thoroughly decomposed peat is considered most satisfactory for this purpose.

The quantity of peat sold for use as fertilizer during 1914 was 14,962 short tons, as fertilizer filler 22,267 tons, and for fuel and miscellaneous purposes 9,364 tons.

Report of analyses of commercial fertilizers, (*La. Dept. Agr. and Immigr. Fert. Rpt. 1913–14, pp. 122*).—This bulletin contains actual analyses, made at the Louisiana State Experiment Station, of 8,958 samples of fertilizers and fertilizing materials offered for sale in Louisiana in 1913–14, together with their guaranties.

Commercial fertilizers, J. L. HILLS and C. H. JONES, C. G. WILLIAMSON, and G. F. ANDERSON (*Vermont Sta. Bul. 190 (1915), pp. 385–439*).—Actual and guarantied analyses and valuation of 173 samples of fertilizers and fertilizing materials offered for sale in Vermont during 1915 are reported, showing that 83 per cent of the brands met their guaranties. "The quality of the crude stock used seemed to be beyond reproach, save as regards the organic nitrogen in a few brands."

Data on the relation between selling price and valuation of fertilizers indicate that during the year "one dollar in three spent for mixed fertilizers was paid to the manufacturer, railroad, and selling agent for their work, while but two of the three were paid for plant food. But 55 cts.' worth of plant food was bought for a dollar in average low-priced goods, and 63 cts.' worth in medium-priced goods. The average high-priced brand, however, afforded 70 cts.' worth for a dollar."

AGRICULTURAL BOTANY.

Physiology of the intake of material by the living plant cell.—II, Changes produced by potassium cyanid in the permeability of the vegetable plasma-membrane, M. KREHAN (*Internat. Ztschr. Phys. Chem. Biol., 1 (1914), No. 3-4, pp. 189-259, figs. 9; abs. in Jour. Chem. Soc. [London], 108 (1915), No. 629, I, pp. 108, 109*).—Summarizing the more general results of the tests detailed, the author states that the point of concentration at which plasmoylsis of plant cells occurs in solutions of certain salts named is raised above that which is normal to the plant by the addition of potassium cyanid in suitable proportions. The effectiveness varies with its concentration and the length of exposure thereto, the effects being reversible after use of the less concentrated solutions. This elevation is not due to retention within the cell of osmotically-active substances caused by the limiting influence of potassium cyanid on respiration, but is due partly to its influence on the colloids of the plasma membrane and partly to the increased permeability of the membrane for certain solutes of the external medium.

Physiology of the intake of material by the living plant cell.—III, Influence of neutral salts and some nonelectrolytes on the injurious effects of alcohols on plant cells, HELENE NOTHMANN-ZUCKERKANDL (*Internat. Ztschr. Phys. Chem. Biol., 2 (1915), No. 1, pp. 19-41; abs. in Jour. Chem. Soc. [London], 108 (1915), No. 630, I, pp. 199, 200*).—Following up the report of Krehan noted above, the author states that the exosmosis from leaves of Echeveria, *Saxifraga sarmentosa*, and *Tradescantia discolor* in aqueous solutions of the lower alcohols is augmented by the addition of neutral salts. The increase is due, apparently, not to an altered solubility of the alcohol but to the summation of the tendencies separately shown by the dissolved substances.

With higher alcohols, however, the osmotic effect of the solutions is usually reduced by addition of the salts. It is thought that in this case the alcohol and the salt obstruct each other in entering by the same path, this view being confirmed by experiments employing plasmolysis. Entrance is thought to be afforded by the hydrocolloids of the plasma.

Tannic or aspartic acids or peptone increase the action of the various alcohols, but glycin, tyrosin, sucrose, and maltose are inactive.

The influence of salts on heliotropism, INES MARCOLONGO (*Bul. Orto Bot. R. Univ. Napoli, 4 (1914), pp. 211-221*).—Describing the effects of various admixtures of equimolecular solutions of certain potassium, sodium, calcium, and magnesium salts on seedlings of oat, bean, and mustard, the author states that all these salts increase the readiness and degree of the heliotropic response of etiolated, but lower those of the normally growing, plantlets.

It is thought that the effects observed may be ascribed to the chemical action of the nutritive salts without excluding a physico-chemical influence related to the concentration of the solution.

A bibliography is appended.

A three-salt nutrient solution for plants, J. W. SHIVE (*Amer. Jour. Bot., 2 (1915), No. 4, pp. 157-160*).—The author gives a preliminary report on his experimentation with wheat and buckwheat in attempting to devise and use a simpler nutrient solution than the 4-salt mixture used by Tottingham (E. S. R., 31, p. 425), potassium nitrate being omitted from the Knop formula as used by that investigator.

From the results as tabulated it is claimed that the 3-salt mixture, in proper proportions, is eminently suitable for plant development. It gave a markedly better growth of tops than the 4-salt solution, at least with a total osmotic con-

centration of 1.75 atmospheres, which is said to be a suitable strength for general water-culture work.

The absorption of ions by living and dead roots, H. V. Johnson (*Amer. Jour. Bot., 2 (1915), No. 5, pp. 250–254*).—The author holds that unequal absorption of anions and cations by roots may be due to the dead rather than to the living cells. In experiments with beets and carrots he found that the ratios of the cations absorbed were different in the dead from those observed in the case of the living plants. In sweet corn the dead roots took up somewhat more calcium than chlorin, but this was not true of white field corn, which gave results comparable to those of a single experiment made with dead turnips.

It appears, therefore, that the presence of dead cells has a very marked influence on the results in some cases. It is suggested also that observed results may be vitiated by the killing of some of the cells by the solutions during the experiment.

The influence of Röntgen rays on the seeds of Vicia faba as shown in the development of the plants, T. Pfeiffer and W. Simmermacher (*Landw. Vers. Stat., 86 (1915), No. 1–2, pp. 35–43*).—The authors have studied the after-effects of Röntgen rays on *V. faba* seeds and seedlings, employing complete darkness, the light from a north window, or that in the open. The seeds, before being sprouted, were exposed to the rays for 30, 60, 90, 120, and 150 seconds, the exact strength of the tubes not being reported.

It is stated that the germinability of *V. faba* was increased by previous exposure to the Röntgen rays for a moderate period of time, but that it was lessened by the longer exposures. The production of dry substance was increased only in case of limited after-illumination. Longitudinal growth of the aerial portion was somewhat increased in diminished light, great individual differences appearing in this series of tests.

On the relation of root growth and development to the temperature and aeration of the soil, W. A. Cannon (*Amer. Jour. Bot., 2 (1915), No. 5, pp. 211–224, figs. 5*).—The results of the direct aeration experiments on the reaction of roots were not deemed entirely consistent, and these are to be repeated.

It appears from the results of tests as given that roots which lie close to the surface of the soil are subject to the influence of an environment quite different from that affecting the deeply placed roots. It is considered fair to assume that the characteristic differences in mature root systems are largely the results of unlike responses to the environmental conditions.

The root factor presents two phases, the root character itself and the manner of response to the soil environment. In the former case, especially in obligate deeply penetrating roots, the limiting factor appears to be only the depth of the soil. In species having generalized roots and roots which are essentially shallow growing the limiting factors relate to root response to such environmental features as moisture, aeration, and temperature. Species having plastic roots or roots capable of response to a wide range of soil environment should be more widely distributed than those less capable in these respects. This conclusion is said to have been supported by observations so far as they have shown the true conditions.

Studies on the transpiring power of plants as indicated by the method of standardized hygrometric paper, A. L. Bakke (*Jour. Ecology, 2 (1914), No. 3, pp. 145–173, figs. 2*).—Employing the method of standardized cobalt chlorid paper essentially as devised by Livingston (E. S. R., 28, p. 528), the author has made a study of the daily course of foliar transpiration, the relation of position and age of the leaves thereto, the relation of the diurnal to the nocturnal foliar activity, transpiration as an index of xerophytism or of mesophytism,

the transpiring power of floral parts, the relation of transpiration to wilting, and transpiring power as an index of drought resistance.

The results as detailed are said to show the suitability of the method for use in the study of several aspects of ecological behavior. It may offer a simple and adequate means of classifying plant forms in a scale of xerophytism or of mesophytism, based upon water requirement so far as this depends upon foliar transpiring power, which in turn must take into account the full diurnal course of transpiration, or at least numerous daily determinations.

Age, position, and structure of the leaves may influence transpiring power, as may also the humidity of the surrounding media.

A bibliography is appended.

The anthocyan pigments, A. E. EVEREST (*Sci. Prog. Twentieth Cent., 9 (1915), No. 36, pp. 597–612, figs. 5*).—This is a review of work bearing upon the nature and composition of the red, purple, and blue flower pigments.

Our present knowledge of the chemistry of the Mendelian factors for flower color, MURIEL WHELDALE (*Jour. Genetics, 4 (1914), No. 2, pp. 109–129, pl. 1; abs. in Internat. Inst. Agr.* [*Rome*], *Mo. Bul. Agr. Intel. and Plant Diseases, 6 (1915), No. 3, pp. 404, 405*).—In the present paper an attempt has been made to state, from the evidence available, just what is known of the chemical mechanism underlying the Mendelian factors for flower color, and the views of several investigators are discussed.

It is stated that there are varieties of *Antirrhinum majus*, ivory, yellow, and white, which do not form anthocyanin, ivory being dominant to yellow and containing a factor which is absent from yellow. It is claimed that the pigments in the ivory and yellow varieties are flavones, ivory containing a pale yellow flavone, apigenin, and yellow containing in addition a deeper yellow flavone, luteolin, the formation of which is presumably inhibited by the factor which is present in the ivory. The white variety contains no flavone. When the yellow or ivory is crossed with a white of suitable composition, the F_1 descendants contain anthocyanin, which therefore appears to have been formed from a flavone by the action of some factor contained in the white. It has been suggested that anthocyanin is either an oxidation or a condensation product of a flavone, or both.

Two anthocyanins have been isolated from Antirrhinum, red and magenta, the latter containing a factor which is absent from the red. Both red and magenta contain more oxygen than do the flavones, and magenta contains more than red.

A bibliography is appended.

Our present knowledge of the chemistry of the Mendelian factors for flower color, II, MURIEL WHELDALE (*Jour. Genetics, 4 (1915), No. 4, pp. 369–376*).—Since the appearance of the above paper, further work on this subject by several authors has appeared, and the present paper is concerned with the bearing of the results announced on the genetics of flower color.

The origin of dwarf plants as shown in a sport of Hibiscus oculiroseus, A. B. STOUT (*Bul. Torrey Bot. Club, 42 (1915), No. 8, pp. 429–450, pls. 2*).—An account is given of studies carried out with the progeny of a single dwarf plant of *H. oculiroseus*, which is said to have appeared in a pedigreed culture as a sporadic variation, differing from the robust form in having short internodes, dwarf stature, and smaller leaves (many of which were crinkled), also in the development of lateral branches near the base.

Plants intermediate in form appear in the progeny of this individual, possessing one or more characters of the dwarf type in some degree of development, but no dwarf was found among the 103 descendants of its 4 sister plants.

The common parent possessed in a slight degree the crinkled leaves and shortened internodes.

The dwarf plants appeared in varying numbers along with robust and intermediate types. The dwarf plants show a strong tendency to breed true, one series giving 72 dwarf plants, 8 intermediates, and 1 robust plant.

It is thought that the differences are not readily explained by a loss or gain of characters. There is no series of characters in *H. oculiroseus* or *H. moscheutos* that can be considered as combining in hybridization to produce the dwarf.

The simultaneous appearance of variations involving modifications of groups of characters and of intermediates of various kinds exhibiting sporadic variations of various degrees of intensity is quite in line with the general evidence of the sporadic nature and wide range of such variations.

A bibliography is given.

The flora of the Northwest Coast, C. V. PIPER and R. K. BEATTIE (*Lancaster, Pa.: New Era Printing Co., 1915, pp. XIII+418*).—A descriptive flora, with keys, is given of the pteridophytes and spermatophytes known to occur in that portion of Washington and Oregon lying west of the Cascade Mountains and between 43° 30′ and 49° N. latitude, although the northern range of many of the species extends well within the boundaries of southern Alaska.

In the flora 1,617 species representing 550 genera are included, of which the following species are described as new: *Arctostaphylos columbiana, Godetia gracilis, Panicularia occidentalis, Populus vancouveriana, Solidago algida, S. vespertina,* and *Grindelia oregana wilkesiana.* In addition to these newly described species, 14 new combinations of generic and specific names are given.

The material upon which this work is based is quite largely deposited in the herbarium of the State College of Washington, with which institution the authors were connected for a number of years.

An Aztec narcotic (Lophophora williamsii), W. E. SAFFORD (*Jour. Heredity, 6 (1915), No. 7, pp. 291–311, figs. 11*).—An account is given embodying some results of a study made by the author on the mushroom-like narcotic cactus or peyote (*L. williamsii*).

The name of the soy bean: A chapter in its botanical history, C. V. PIPER (*Jour. Amer. Soc. Agron., 6 (1914), No. 2, pp. 75–84*).—Giving a brief account of recent studies and other information on the botanical history of the soy bean and the names that have been applied to this and related species, the author holds that a proper interpretation thereof requires that the soy bean should be named *Soja max.*

Inventory of seeds and plants imported by the Office of Foreign Seed and Plant Introduction during the period from April 1 to June 30, 1913 (*U. S. Dept. Agr., Bur. Plant Indus. Inventory No. 35 (1915), pp. 69, pls. 8*).—Descriptive notes are given of over 500 plant introductions, much of the material having been secured by Meyer in China and Wight in Chile and Peru. Miscellaneous contributors supplied the remaining material.

FIELD CROPS.

Prices and shrinkage of farm grains, W. L. BURLISON and O. M. ALLYN (*Illinois Sta. Bul. 183 (1915), pp. 11–26, figs. 5*).—In discussing the prices and shrinkage of farm grains the authors have been governed largely by reports of the Chicago Board of Trade. Tabulated data show the average prices of farm grains, by 5-year periods, from 1879 to 1913. Monthly price averages for farm grains, together with the monthly percentages of total annual receipts for the decade 1904 to 1913, are represented by curves and graphs. Tables show the

average shrinkage of corn by months for the years 1903 to 1913, excepting 1904 and 1908, at Urbana, Ill., and the prices necessary each month to compensate for shrinkage.

The findings of the investigations are summarized as follows:

"Prices of farm crops in general are regulated by commercial market quotations, which in turn are governed by supply and demand. The increase in prices of crops within the last few decades has not been so great as many people have believed. By comparing the average prices for the 15 years preceding the financial crisis of 1894 to 1898 with the average prices for the 15 years succeeding this period, it will be seen that the average increase has been only 9.2 cts. per bushel for corn and 6.5 cts. for oats, while the average price for wheat has not increased. The price for barley has tended to decrease, while the price for rye has increased about the same as that for corn.

In general for the last 30 years the times of lowest average price for corn, wheat, and oats correspond closely to the times of largest average receipts. Except during the summer months, the same is true for rye and also for barley during the last ten years.

"Shrinkage is one of the most important factors to be taken into consideration in holding corn for higher prices. The total shrinkage during the year is more than 15 per cent. Taking November as a base, the data show that there is no month for which the price increases sufficiently to compensate for shrinkage. If January or February is taken as a base, then the increase in price up to but not including October more than compensates for shrinkage alone. Not so much is known of the shrinkage of wheat and oats as of corn. It may be said that they shrink comparatively little after they have gone thoroughly through the sweat. It would seem profitable, so far as shrinkage alone is concerned, to hold small grain until the time of highest prices."

Crop rotation, R. T. Burdick (*Vermont Sta. Bul. 190 (1915), pp. 440–460, pls. 4*).—This article discusses the principles and practice of crop rotation. It summarizes available data obtained at several experiment stations, suggests a number of rotations, and presents a short bibliography.

Concerning the corn crop, J. L. Hills (*Vermont Sta. Bul. 189 (1915), pp. 329–380*).—This article is of an informational character, compiled from many sources, and treats of the origin and extent of the crop, varieties, corn breeding, seed corn, climatic requirements, corn culture, and management of the crop, pests, harvest, silos, shrinkage, corn judging, feeding, corn feeds, and school lessons.

A bibliography of U. S. Department of Agriculture and state experiment station publications covering this field is appended.

Development of the cotton plant under the influence of various fertilizers and at different degrees of humidity of the soil.—Vegetation experiments in 1911 and 1912, R. Shreder (*Izv. Turkest. Selsk. Khoz. Opytn. Stantsiĭ, 5 (1913); abs. in Zhur. Opytn. Agron. (Russ. Jour. Expt. Landw.), 15 (1914), No. 5, pp. 386, 387*).—In vegetation experiments conducted in 1903 and 1904 it was found that only in the presence of sufficient moisture could the fertilizers introduced exert their full influence, and that high humidity in conjunction with nitrogenous and phosphatic fertilizers gave the highest yields. The data obtained with reference to evaporation show that at any degree of humidity the evaporation proceeded most economically under conditions of optimum nutrition (nitrogen plus phosphorus).

The experiments of 1911 showed that the best yields were obtained when the humidity amounted to 60 per cent of the total capacity.

The experiments with fertilizers in 1912 gave the following results: With nitrate of soda and superphosphate the total yield doubled. With red clover as

a green manure the yield increased more than twice. Alfalfa did not act so favorably. The stems of the cotton plant proved to be a valuable fertilizer, the yield more than doubling.

The handling and marketing of the Arizona-Egyptian cotton of the Salt River Valley, J. G. MARTIN (*U. S. Dept. Agr. Bul. 311 (1915), p. 16, pls. 3*).—This bulletin records results of investigations in 1913 and 1914 to discover the effect of proper and improper handling of Egyptian cotton in the Salt River Valley from the time it was picked until it was loaded into cars preparatory to its departure for the mills. The topics discussed include the necessity for clean picking, storage of seed cotton, ginning the Arizona-Egyptian cotton, sampling cotton at gin stands, baling and covering the cotton, advisability of gin compression, tagging, marking, branding, and weighing the cotton, storage of ginned Egyptian cotton, classing the Arizona-Egyptian cotton, staple lengths, tables of classification, advantages of grading cotton, and marketing of Arizona-Egyptian cotton.

The Arizona grades given to the cotton as a result of this study, and which correspond to the official cotton standards of the United States are fancy, extra, choice, standard, and medium.

From the results the following conclusions are drawn: "The increase in the estimated size of the Salt River Valley Egyptian cotton crop from 280 bales in 1912 to 2,200 bales in 1913, and to 6,187 in 1914, demonstrates the peculiar fitness of this locality for the production of Egyptian cotton. The continued improvements in methods of handling and equipment will serve to improve the grade of the product, while the classing of the cotton will tend to secure a more stable market at better and more uniform prices. Up to the present time the relatively small crop from the Salt River Valley has been so distributed that only a few spinners have been able to test this cotton. The testimony from a number of various sources, including some of the largest cotton firms, spinners, and exporters, indicates that the quality, character, and length of staple of this cotton is of such a nature as will establish for it a permanent market."

Results of selection of seed tubers in potato culture, CLAUSEN (*Jour. Landw., 63 (1915), No. 1, pp. 1–32, fig. 1; abs. in Gartenflora, 64 (1915), Nos. 11–12, pp. 187–192; 13–14, pp. 220–224*).—This article describes the work, presents data, and gives the results of selection of seed tubers carried on at Heide, in Holstein, Prussia, since 1908. Three varieties were used in this work, namely, Six Weeks, Egg, and Up-to-Date, and line selection was carefully followed in each experiment in order to eliminate any factors that a heterogeneous parentage might introduce. The author has drawn the following conclusions from the data obtained:

The yield increases with the increase in size of the seed tuber. Early varieties respond to the selection of heavy seed tubers better than late varieties. Heavy seed tubers have a greater value on thin or unfertilized soil than on rich soil. The larger the seed tuber the smaller will be the yield per unit weight of seed. Increasing the size of the seed tuber increases the number of tubers in the yield. The selection of large seed tubers did not lead to an increase in the size of the tubers in the offspring. The inheritance of tuber numbers vanishes when all tubers are planted, but is evident when seed tubers of equal size from different mother plants are compared in their productivity. Two tubers or pieces of tubers planted in the same hill did not yield as much as did seed planted singly but occupying the same soil area.

The relation of moisture to yield of winter wheat in western Kansas, L. E. CALL and A. L. HALLSTED (*Kansas Sta. Bul. 206 (1915), pp. 34, figs. 12*).—This

bulletin describes experiments conducted at the Fort Hays substation in cooperation with the Bureau of Plant Industry of this Department.

Meteorological data show the monthly precipitation for a period of 46 years aggregating 22.98 in. per annum, while evaporation that took place from a free-water surface during the growing season for a period of seven years (1907 to 1913, inclusive) averaged 49.344 in. Other data show the moisture conditions of the soil and the crop yields for each season (1910 to 1913, inclusive) for soil that had been prepared for wheat by late fall plowing, early fall plowing, and fallowing.

The average results for the four years show that the late fall-plowed ground contained 2.7 per cent of available moisture at seeding time, early-fall-plowed ground 4.2 per cent, and summer-fallowed ground 8.8 per cent. The late-fall-plowed ground produced an average of 5.9 bu. of wheat, early-fall-plowed ground 11.1 bu., and summer-fallowed ground 21.2 bu.

As an average of six years, ground subsoiled once in three years and prepared each season for wheat by plowing early in the fall has produced an average yield of 18.1 bu. an acre, or 3.9 bu. more than ground plowed at the same date but not subsoiled. Alternate cropping and summer fallowing have produced an average yield of 21.3 bu. of wheat an acre, or an average annual yield of 10.6 bu.

Occurrence of manganese in wheat, W. P. HEADDEN (*U. S. Dept. Agr., Jour. Agr. Research, 5 (1915), No. 8, pp. 349–355*).—The author briefly reviews the work of other investigators in this field, describes the methods employed in this investigation, which was conducted at the Colorado Station, and gives tabulated data showing the amounts of iron or manganese found in the kernels of wheat samples secured from various parts of the United States, Canada, and Europe. The quantity of manganese found ranged from 0.003 to 0.008 per cent.

"Manganese seems to be present in wheat wherever grown, irrespective of the conditions of soil and climate. Manganese is present in the wheat kernel in about the same proportion as iron, though iron greatly predominates in soils. Fertilizers applied to the soil did not affect the amount of manganese stored in the kernels. Variation in the quantity of water applied, from 1 to 3 ft., did not affect the amount of manganese in the grain. I do not wish to draw conclusions from my facts relative to the essential character of manganese as a mineral constituent of plants, though these facts seem to support this view for wheat and possibly for emmer, rye, oats, etc. It seems improbable that a nonessential constituent would occur in all samples and in essentially the same quantity under such a variety of conditions."

Wheat—barley, P. SYMEONIDES (*Cyprus Jour., No. 39 (1915), p. 884*).—This briefly describes a cereal known locally on the Island of Cypress as "Sitarokrithi." It is considered a hybrid between wheat and barley.

Quack grass eradication, A. C. ARNY (*Minnesota Sta. Bul. 151 (1915), pp. 82, figs. 26*).—In part 1 of this bulletin the author describes the characteristics of quack grass and gives methods employed in two experimental fields in efforts to eradicate the weed. Part 2 contains tabulated data of the operations on the fields under rotation. The following is a summary of results of several years' work:

"Quack-grass seed will grow even if the plant is cut before the seed is mature. In order to prevent quack grass from developing seeds to the point where they will germinate, crops in which it is growing should be cut not later than the last week in June. Young quack-grass plants, if attacked before they have formed underground stems, are as easily killed as plants of wheat or other grains of the same age. Manure containing quack-grass seed may be

applied on plowed ground before preparing the soil for a cultivated crop. The seed will grow the same season and the young plants will be killed in the preparation of the seed bed and the cultivation of the crop. Digging by hand and removing from the field all portions of the plant, smothering with tar paper, and spraying with a solution of sodium arsenite are best for the complete eradication of quack grass on small spots. All methods of eradication on large fields are based on thorough tillage. The implements found on any well-equipped farm are all that are needed to eradicate quack grass.

"The most effective bare-fallow method of eradication was plowing in July 3 or 4 in. deep, replowing not later than August 15 5 or 6 in. deep; and again in November 6 or 7 in. deep. The disk was used as needed between plowings to keep the quack grass from showing green above ground. The cost of the additional labor necessary for complete eradication under this system was $9.60 per acre. No crop was secured from the land that season.

"Complete eradication of quack grass while following a system of crop rotation was found practical when more than the ordinary amount of tillage was given . . . To be effective there must be a well-planned and carefully carried out campaign with which other work is not allowed to interfere. Tillage operations should injure the quack grass as much as possible and should be repeated often enough to make effective the work that has preceded. Eradication of quack grass on land that has been plowed each year is more difficult than on land that has been undisturbed for a number of years.

"In carrying out the different rotations a regular plan of 'clean-up' to eradicate the quack grass was followed on each field with uniformly successful results. The plan was varied on three of the fields to secure additional data. A 4-year rotation on four fields, each one in turn having in successive years grain, hay, corn, and corn, gives exceptional opportunity for the eradication of quack grass. This rotation can be followed to advantage, especially on fields where quack grass is very vigorous or when weather conditions make the eradication unusually difficult. The average cost per acre of the labor necessary for complete eradication, in addition to that which, under good farm practice, would be given the same fields growing identical crops, was as follows: Five-year rotation, $10.10; 4-year rotation, $8.71; 3-year rotation, $13.45; 2-year rotation, $8.50; continuous cropping schemes, $7.71."

HORTICULTURE.

The vegetable garden, R. L. WATTS (*New York: Outing Publishing Co., 1915, pp. 186, pls. 8*).—A popular treatise on vegetable gardening, the first part of which deals with the general principles of gardening, including where to grow vegetables; hotbeds, cold frames, and greenhouses; starting early vegetable plants; tillage problems; stable manures and cover crops; commercial fertilizers; the seed supply; marketing; intensive gardening; and the home garden. The concluding chapter contains specific cultural directions for all of the common vegetables. Data relative to planting distances and quantity of seed required are appended.

Cantaloup marketing in the larger cities, with car lots supply, 1914, W. A. SHERMAN, A. D. GAIL, JR., and FAITH L. YEAW (*U. S. Dept. Agr. Bul. 315 (1915), pp. 19, pl. 1, figs. 7*).—This bulletin embraces the results of a study made in a number of the larger markets in the East and Middle West in an effort to determine the factors which underlie the successful handling and marketing of cantaloups. In addition to a discussion of various factors influencing the industry, a map, charts, and tabular data are given showing the sources, seasonal distribution, and total shipments of cantaloups in 1914.

The shipments as a whole amounted to about 16,500 cars of which California shipped nearly one-third. Colorado shipped nearly 3,000 cars and Delaware, Indiana, Georgia, and North Carolina about 1,000 cars each.

What the agronomy department is doing to help the canner, J. I. Etheridge (*Canner and Dried Fruit Packer, 41 (1915), No. 23, pp. 42, 43*).—A summarized account is given of work conducted at the Wisconsin Experiment Station and its substations in developing improved strains of canning peas.

The marking factor in sunflowers, T. D. A. Cockerell (*Jour. Heredity, 6 (1915), No. 12, pp. 542–545, figs. 2*).—In this article the author presents evidence to show that the marking factors in sunflowers form a quite definite system independent of color characters.

Report on the statistics of vineyards, orchards and gardens, and root crops for the season 1914–15, L. H. Sholl (*So. Aust. Statis. Dept. Bul. 3 (1915), pp. 6*).—Statistics on the area, production, and value are given for the year 1914–15, together with comparative data for the four previous seasons.

The self-sterilizing problem, E. J. Kraus (*Jour. Heredity, 6 (1915), No. 12, pp. 549–557, figs. 3*).—In this paper the author calls attention to a number of unsolved questions with reference to the pollination of fruit, discusses recent progress in the study, and shows the need of distinguishing the various morphological and physiological factors entering into the problem.

Notes on the pollination of orchards, C. H. Hooper (*Fruit, Flower, and Veg. Trades' Jour.* [*London*], *28 (1915), Nos. 10, pp. 274, 275; 12, p. 325; 13, p. 343*).—As a result of observations made of a large number of orchards during the season of 1914, the author presents notes on the relative fertility of different varieties of apples, pears, plums, and cherries when grown in proximity to certain other varieties as well as their relative failure to mature fruit when isolated. Attention is also called to the behavior of some of these varieties in other countries.

The transfusion of sap, R. Holmes (*Gard. Chron., 3. ser., 58 (1915), No. 1498, p. 173; abs. in Agr. News* [*Barbados*], *14 (1915), No. 354, p. 373*).—The author calls attention to a case in which a large plantation of one variety of fruit trees failed to fruit. It was found that branches of these trees would fruit freely when artificially pollinated with pollen of another variety. Consequently, a graft of the pollinating variety was inserted on the top of each tree for the purpose of insuring the presence of fertile pollen. The operation proved successful in causing the trees to fruit, but since the grafts bore no flowers the author advances the suggestion that the character of producing fertile pollen may be introduced into sterile varieties of fruit trees by transfusion of sap. Experiments are being conducted along this line by budding Pond Seedling plum on Greengage trees.

Protection of orchards against frost by means of American orchard heaters, S. A. Mokrzhetskiĭ (*Zashchita Sadov ot Zamorozkov Amerikanskimi Obogrie͡vateli͡ami. Simferopol: Salgirskai͡a Opytnai͡a Plodovodstvennai͡a Stantsii͡a, 1915, pp. 15, figs. 8*).—An account is given of some orchard heating experiments conducted by the Salgir Experimental Horticultural Station, including the results secured with various American orchard heaters.

Renovation of the neglected orchard with special reference to the best orchard practice, M. B. Davis (*Canada Expt. Farms Bul. 79 (1914), pp. 32, pl. 1, figs. 14*).—This bulletin, prepared with special reference to the renovation of old orchards in eastern Canada, discusses the practice and results of dehorning; thinning out trees, scrapping, cleaning, and tree surgery; system of cultivation; cover crops and kinds to use; fertilizing; and spraying and thinning the fruit, including some results secured from spraying and thinning.

The apple, A. E. Wilkinson (*Boston and London: Ginn & Co., 1915, pp. XII+492, pls. 4, figs. 195*).—A practical treatise on modern practices in apple growing, based largely upon recent literature on the subject.

The succeeding chapters discuss selection of site; adaptation of varieties to soils; orchard heating; selection of the trees; windbreaks; the use of stable manure in the orchard; preparing land for an orchard; laying out an orchard; planting; proper pruning; cover crops; fertilizing; cultivation; sod culture *v.* tillage; irrigation and drainage; intercropping; thinning; insects; diseases; spraying; miscellaneous injuries; picking; grading; packing; marketing; storage; by-products; cooperation; costs, yields, and profits; growing apples for the home; renovating neglected orchards; propagation; pollination; breeding; exhibits, scoring, judging, and describing; color; fruit growing in various sections of the United States; and varieties. Tables on prices in the New York market for 30 years, together with a chart showing the preferences of different United States markets for various apple varieties, are appended.

Comparison of the growth of apple trees pruned and not pruned in the season of planting, F. J. Chittenden (*Jour. Roy. Hort. Soc., 41 (1915), No. 1, pp. 97–109*).—The experiment here reported was designed to ascertain whether varieties of apples having different growth characters respond differently in respect to their treatment after planting, and whether the use of different stocks makes any difference in this respect. Some varieties were grown on Paradise stock and some on Crab stock. Data secured for different varieties are presented in tabular form and discussed.

The results as a whole led to the conclusion that all varieties of apples grow better in the first season when pruned at planting than when left unpruned. The check imposed by neglect of pruning is felt by trees on Paradise stock for at least three years after planting, while unpruned trees on Crab stock appear to recover more quickly and perhaps even to gain slightly in their second and third years. It is believed that the difference in behavior of the trees on different stocks may explain the difference which has arisen in practice as between pruning the first and the second years, since trees growing on Crab stock appear to do nearly as well when pruned the second year as if pruned the season of planting.

Hardiness in the apple as correlated with structure and composition, S. A. Beach and F. W. Allen, Jr. (*Iowa Sta. Research Bul. 21 (1915), pp. 159–204, figs. 23*).—This bulletin reports in detail several studies conducted to determine some satisfactory index for distinguishing hardy apple trees before they are old enough to fruit.

Some 2,000 individual cutting, compression, and penetration tests were made of green and dry scions taken from several varieties of apples growing in Iowa, as well as in other parts of the United States and in Canada. The results of these tests as a whole suggest that there is a rather close correlation between hardness of the wood and the ability to withstand cold. At the same time the variation in certain cases is so great that this conclusion is not given as a hard and fast rule. Twigs from northern sections, except the forms of *Malus rivularis* and the varieties Red June and Patten, were no harder than twigs from Iowa and farther south.

The possible correlation between hardness of wood and hardiness was also investigated from the standpoint of specific gravity. The specific gravity tests of dry wood show a density corresponding very closely with the mechanical tests showing hardness, indicating that the two tests are fairly accurate means to the same end. Variations in the specific gravity of twigs of the same variety from different sources were noted, but twigs of the same variety from the same source gave fairly uniform results. The specific gravity of twigs varies to some

extent, depending upon what part of the twig is used. Based upon tests made in July, it was found that the tenderer varieties which mature a little later in the summer gave the greatest specific gravity a short distance back of the tip. Earlier maturing varieties increased in specific gravity in proportion to the distance from the tip.

Studies were made of nursery twigs at different seasons of the year and at different temperatures, with the view of determining the extent of correlation of maturity and water content with hardiness. The results of these studies taken in consideration with the data from similar lines of investigation led to the conclusion that the maturity of the wood at the time cold weather sets in has the most important bearing on the ability of the tree to withstand cold. The hardier varieties on the average had a slightly lower moisture content than the more tender varieties, this difference being more marked during the growing season. The more tender sorts evaporate water more readily than do the hardy varieties. After a period of very cold weather the twigs of the hardy varieties are generally found to contain the most moisture.

Studies of the structure of stems in relation to hardiness as conducted by the authors and a number of other investigators show that the rate of evaporation is modified by small differences in thickness and structure of the bark, including differences in the number of cutinized layers. A lower rate of evaporation in the hardier varieties appears to be due to a denser cell sap. Most of the hardy varieties contain a large amount of starch stored in the pith and medullary rays. Forms of *M. ioensis*, however, proved to be an exception in this regard.

Studies were also made of the morphological differences in apple blossoms as to their correlation with the hardiness of the variety. The results of this work indicate that large thick petals are correlated with hardiness, although the converse of this is not always true.

Freezing tests were conducted to determine, if possible, the temperatures at which various twigs will kill under a given condition. All twigs not previously dried were injured to some extent when held in a temperature of —10° F. for 20 minutes. The injury which occurred was found to be inversely proportional to the hardiness of the variety. Even those varieties which can withstand from —25 to —40° under natural conditions can not withstand a sudden drop in temperature to even —10°; from which it is concluded that a sudden drop in temperature is more injurious than the actual degree of cold.

With reference to the results of their investigations as a whole the authors conclude that "while in the various lines of comparison which were made there were found many indications of morphological differences between hardy and tender varieties, yet from the practical viewpoint it is impossible as yet to name any one test by which the degree of constitutional hardiness of a seedling apple may be foretold. Among the various tests for hardiness, that of the length of season required by the tree to mature the season's growth is of first importance. Perhaps by taking careful notes on a number of trees of any particular variety for two or three years or more, noting their time of starting and cessation of growth, their ability to produce a good root system from the scion, their water content, the resistance of their twigs to sudden zero temperatures, and their rate of evaporation, a pretty accurate idea of the ability of the tree to withstand cold might be obtained. If, in addition, the variety has hard wood, a good amount of stored starch, and large petals, these would be further indications of hardiness, although from this study it appears that these points are of less importance than those first named."

A special apparatus used in making mechanical tests of small twigs is illustrated and described. References are given to related studies on hardiness.

Dwarf apples not commercially promising, F. H. Hall (*New York State Sta. Bul. 406, popular ed.* (*1915*), *pp. 8, figs. 2*).—A popular edition of the bulletin previously noted (E. S. R., 33, p. 639).

What it really costs [to grow peaches], R. W. Page (*Country Gent., 80* (*1915*), *No. 47, pp. 1750, 1772, fig. 1*).—Detailed cost data are given on seven years' work in a peach orchard in Moore County, N. C.

The French vines and the hybrid direct bearers in 1915, E. Pée-Laby (*Vie Agr. et Rurale 5* (*1915*), *No. 20, pp. 357–362*).—Notes are given on the behavior of various hybrid direct-bearing grapes during the season of 1915, in which season the French vineyards suffered severely from mildew and insect attacks.

Cover crops in citrus culture, C. S. Vaile (*Mo. Bul. Com. Hort. Cal., 4* (*1915*), *No. 10, pp. 456–461*).—A paper on this subject read before the California State Fruit Growers' Convention, in July, 1915, and based primarily upon experiments conducted by the citrus substation at Riverside.

During the past few seasons the vetch and pea crops in certain localities have been seriously attacked by aphids and much acreage destroyed. The results of the substation experiments indicate that purple vetch (*Vicia atropurpurea*) and sour clover (*Melilotus indica*) are not only resistant to this trouble but also yield a heavy growth for incorporation as green manures.

Green manure crops in Java, W. M. Van Helten (*Meded. Cultuurtuin* [*Buitenzorg*], *No. 2* (*1915*), *pp. 35, pls. 4*).—This paper gives short notes on the green-manure crops discussed in a previous communication (E. S. R., 30, p. 741), together with the results from practical experiences and investigations with green manures in different parts of Java, and the results secured in the Buitenzorg Cultural Garden with some new green-manure crops. Special reference is made to their use in plantations of coffee, rubber, cacao, tea, etc.

Mautsaka coffee, F. F. Bruijning (*Verslag. Landbouwk. Onderzoek. Rijkslandbouwproefstat.* [*Netherlands*], *No. 18* (*1915*), *pp. 115–146, pls. 12, figs. 10*).—A comparative study of the caffein-free Mautsaka coffee and the coffee of a number of different species, including a study of the beans of the various kinds, leads the author to conclude that the Mautsaka coffee can not be classed in any of the known species. Hence, he proposes for it the name *Coffea amara.*

Coffee hybrids, T. Wurth (*Pubs. Nederland-Indisch Landb. Synd., 7* (*1915*), *No. 22, pp. 880–890*).—In this paper the author discusses character transmission in hybrids with special reference to coffee, reviews the present status of hybrid coffees, and gives a list of the more promising types.

Notes on the layering of coffee, Lan and Faraut (*Bul. Écon. Indochine, n. ser., 18* (*1915*), *No. 113, pp. 403–408, figs. 5*).—The authors here describe the successful layering of coffee plants. The layering was performed in the branches of the parent tree, the incised surface being kept in a moist condition with a ball of decomposed paddy and clay loam.

Cacao manurial experiments, J. C. Moore (*Imp. Dept. Agr. West Indies, Rpt. Agr. Dept. Grenada, 1914–15, p. 10*).—Manurial experiments with cacao were started by the Grenada Agricultural Department on a number of estates in 1912. Data are here given showing the various treatments and the yield in wet cacao for the period 1912 to 1914.

Manurial experiments at Nevis, W. I. Howell (*Agr. News* [*Barbados*], *14* (*1915*), *No. 355, pp. 398, 399*).—Data for the first year are given for a series of manurial experiments being conducted under the auspices of the Imperial Department of Agriculture for the West Indies with 7-year-old coconut palms.

Chemical changes in the ripening coconut, T. Vista y Isles (*Philippine Agr. and Forester, 4* (*1915*), *No. 5–6, pp. 109–115*).—A study of the chemical changes occurring during various stages of ripening in the coconut, in which

data relative to changes in color, size, weight, and chemical composition are given and discussed.

Spices, K. HEIJNE (*Netherlands East Indian-San Francisco Com., Dept. Agr., Indus. and Com., Essay No. 27 (1914), pp. 13*).—This pamphlet comprises a short review of the economic importance of the various kinds of spices grown in the Dutch East Indies.

Medicinal plants of Wisconsin, R. H. DENNISTON and R. E. KREMERS (*Bul. Univ. Wis. No. 738 (1914), pp. 22–31*).—A list is here given of those medicinal plants that have been observed within the limits of Wisconsin and which are mentioned in one of the three standard American dispensatories. Data given show the scientific and common name of the plant, the part used, and references to the dispensatories in which information relative to the plants can be found.

The nation's rose garden, F. L. MULFORD (*Amer. Rose Soc. Proc., 1914, pp. 57–63, fig. 1*).—The author gives a progress report on the rose testing garden established in March, 1914, at the Arlington Experimental Farm in cooperation with the American Rose Society. A list is given of the roses now included in the cooperative test.

The rose garden at Cornell University, Ithaca, N. Y., A. C. BEAL (*Amer. Rose Soc. Proc., 1914, pp. 64–66, figs. 2*).—An account similar to the above of the cooperative testing garden of the department of floriculture of the university and the American Rose Society.

Winter-flowering sweet peas at Wisley, 1914–15, C. C. TITCHMARSH (*Jour. Roy. Hort. Soc., 41 (1915), No. 1, pp. 115–122, pl. 1*).—An account is given of a preliminary test of winter-flowering sweet peas, together with notes on a variety test of summer-flowering sweet peas. In the experiment here noted the winter-flowering varieties commenced to bloom freely about the middle of March, whereas the summer-flowering varieties commenced flowering about May 8.

My growing garden, J. H. MCFARLAND (*New York and London: The Macmillan Co., 1915, pp. XIII+216, pls. 36*).—A popular work on ornamental and vegetable gardening, in which the author describes the experiences of himself and family in planting and working the garden throughout each month of the year.

My shrubs, E. PHILLPOTTS (*London and New York: John Lane Co., 1915, pp. VI+132, pls. 50*).—In this work the author gives descriptive notes on several hundred genera of shrubs with their species that he himself has grown.

Report on the condition of the street trees of the city of New York with suggestions for an organized system of scientific culture and conservation of trees for the greater city, H. P. BAKER and H. R. FRANCIS (*Syracuse: N. Y. State Col. Forestry, 1914, pp. 28, figs. 16*).—This report discusses the condition of the street trees in the city of New York and gives suggestions for an organized system of scientific culture and conservation of trees for the city.

The subject matter is based upon a survey of the street trees of the several boroughs of New York City made by the New York State College of Forestry at Syracuse University for the Tree Planting Association of New York.

FORESTRY.

A reference list of some common trees, shrubs, and woody plants of the Oahu lowlands, V. MACCAUGHEY (*Hawaiian Forester and Agr., 12 (1915), No. 11, pp. 290–292*).—The present list includes such trees and shrubs as one would be likely to find along the highway, but not species found only along the beaches.

The ashes: Their characteristics and management, W. D. STERRETT (*U. S. Dept. Agr. Bul. 299 (1915), pp. 88, pls. 16*).—In this bulletin the author discusses the economic status of the ash; differentiates the species, in regard to which there is considerable confusion; indicates the relative importance of the species, including a description of the characteristics of the more important kinds; and outlines methods of forest management for commercial growing of ash timber. A summarized table is given of the species of ash suited for forest management on different sites and in different regions of the United States, together with the methods of reforestation to be used. A number of bark, form, volume, and yield tables for ash are appended.

Shortleaf pine: Its economic importance and forest management, W. R. MATTOON (*U. S. Dept. Agr. Bul. 308 (1915), pp. 66, pls. 10, figs. 7*).—This bulletin has been prepared with special reference to the management and restocking of shortleaf pine areas in the Eastern and Southern States and discusses the adaptability of the shortleaf pine (*Pinus echinata*) for forest management, present supply, annual cut of southern yellow pine, physical and mechanical properties of the wood, uses, the lumber industry, stumpage value, the essentials of forest management, protection, yield, rotation, thinnings, cutting and reproduction, cutting on the National Forests of Arkansas, and regeneration by sowing and planting. A number of volume and form tables, based on measurements taken on the Arkansas National Forest and generally over the southern Mississippi Valley, are appended.

A note on the cultivation of Podophyllum emodi, R. S. TROUP (*Indian Forester, 41 (1915), No. 10, pp. 361–365, pls. 3*).—This note embodies the results of observations on the growth and development of the Indian podophyllum in Jaunsar, United Provinces, and of experiments in its cultivation in the same locality. Special attention has been given this species because of the higher percentage of podophyllotoxin in the resin of this plant than in that of the American species (*P. peltatum*).

Thus far the results of the cultural experiments show that the Indian podophyllum can be cultivated easily, both from seed or from pieces of rhizome, but owing to the very slow growth of the rhizomes it is by no means certain to what extent the plant can be cultivated with profit.

The tapping of the Para rubber tree.—Some physiological experiments, E. BATESON (*Dept. Agr. Fed. Malay States Bul. 23 (1914), pp. 54, pls. 8, figs. 15*).—The author presents the results of a number of experiments conducted at the Kuala Lumpur station to determine the physiological effects of tapping on Para rubber tree. The work of other investigators along similar lines is also discussed.

The present work indicates that if any depletion of the starch reserves is caused by tapping, it is small in amount and temporary in duration. Examination of the starch reserve to determine the time for retapping is unnecessary, the thickness of the renewed bark forming a safe criterion. Trees which are given adequate leaf space will recover in due course from the effects of wintering even if they are continuously tapped. The chief problem is to devise a system of tapping which, over a period of years, will not be so exhaustive to the tree as to check its full and natural development. Observations on trees tapped on two adjacent quarters show that lateral translocation of food material is possible. Actual examination of such trees failed to show any considerable deficiency in the starch reserves. Comparative tests of the single-quarter, adjacent-quarters, and opposite-quarters systems of tapping resulted in the largest yield of latex from the adjacent-quarters system and the smallest yield from the opposite-quarters system. In equally nourished trees tapped by

the three systems, the renewing bark of trees tapped on adjacent quarters will contain the most food. The advantage as to thickness of renewed bark is also in favor of the adjacent-quarters system.

Consideration is given to the theory and practice of tapping, with special reference to the Para rubber tree.

The natural reproduction of sal and how it can be improved, R. S. Hole (*Indian Forester, 41 (1915), No. 10, pp. 351–361*).—In this article the author summarizes the chief results obtained in an investigation relative to the dying back of sal (*Shorea robusta*) seedlings and to determine the conditions most favorable for successful germination and early development of the seedlings.

Growth and yield of spruce in high mountains, A. von Guttenberg (*Wachstum und Ertrag der Fichte im Hochgebirge. Vienna: Franz Deuticke, 1915, pp. 153, pls. 21, figs. 5*).—A contribution to the knowledge of the growth performance and form development of single stems and stands of spruce, based largely on growth and yield data collected by the author for a number of years in the forests of Tyrol and the northern Alps.

Special importance from a scientific point of view is attached to studies of growth and form in single stems as influenced by locality on the one hand and stand density on the other. The large number of stem analyses made has enabled the author to construct normal or model stems of spruce for various localities and stem classes. In view of the lack of data on such old trees, studies of some 200 to 300 year old stands in Paneveggio, South Tyrol, are included in the present work.

Willows: Their growth, use, and importance, G. N. Lamb (*U. S. Dept. Agr. Bul. 316 (1915), pp. 52, pls. 10*).—In this bulletin introductory considerations deal with the range of the willow tree in North America; its various forms; soil, moisture, and light requirements; susceptibility to injury; and the life history of the black willow (*Salix nigra*), which is the most important species. Consideration is then given to the characteristics and uses of willow wood, planting willows, cultivation and care, cutting, cost of growing, and yield from willow plantations.

Under the conditions that have prevailed in the Middle West, where most of the willow plantations have been made, the average cost of growing has been from 50 cts. to $1.50 per cord, estimated on the value of the land at the time of the planting. It is concluded that it should be possible at this time to grow willows at $1 per cord on $25 land. The yield of willows cropped at periods of about 10 years ranges from 1.5 cords per acre per year in poor situations to as high as 7 cords per acre per year under exceptional conditions.

The compilation of girth increments from sample plat measurements, R. S. Troup (*[Indian] Forest Bul. 30 (1915), pp. 9*).—Suggestions are here given with reference to methods of compiling increment data from sample plat measurements.

The Forest Service exhibit, D. C. Ellis (*Amer. Forestry, 21 (1915), No. 264, pp. 1110–1113, figs. 5*).—A descriptive account is given of the exhibit of the U. S. Forest Service at the Panama-Pacific Exposition at San Francisco, 1915.

First biennial report Nebraska Forestation Commission, C. Rohde, A. H. Metzger, and W. Ball (*Bien. Rpt. Nebr. Forestation Com., 1 (1914), pp. 8*).—A report to the Nebraska legislature relative to the problem of afforesting the state schools lands.

List of lands in the Forest Preserve, January 1, 1914 (*Ann. Rpt. Conserv. Com. N. Y., 3 (1913), App., pp. 503*).—This comprises a list of lands corrected to January 1, 1914, belonging to the Forest Preserve of New York State. The total acreage of the Forest Preserve is 1,825,882.71 acres.

The economic phases of forestry with special reference to the Prussian state forests, MARTIN (*Tharand. Forstl. Jahrb., 63 (1912), Nos. 1, pp. 40–58; 2, pp. 79–142; 3, pp. 199–251; 64 (1913), Nos. 1, pp. 1–26; 2, pp. 126–136; 3, pp. 213–230; 65 (1914), Nos. 1, pp. 2–25; 2, pp. 97–112; 3, pp. 211–263; 4, pp. 287–305; 66 (1915), No. 2, pp. 95–117*).—A discussion of various forest problems with special reference to the administration and management of the state forests in Prussia. The subject matter is discussed under the general headings of yield tables, economic principles, the index of the yield capacity of forests, the index of the production of worth, instruction for the execution of the forest regulations in the Prussian state forests, the determination of maturity and period of rotation, and the organization of the forest service.

Forest management in Java, past and present, A. E. J. BRUINSMA (*Boschbouwk. Tijdschr. Tectona, 8 (1915), No. 10, pp. 735–767*).—A descriptive account of the administration and management of the state forests of Java.

Forestry industry, HAKUBANKWAI KYOKWAI (In *Japan and Her Exhibits at the Panama-Pacific International Exhibition, 1915. Tokyo: Société des Expositions, 1915, pp. 119–127*).—This comprises a statistical account of the forestry industry of Japan, prepared with special reference to its use at the Panama-Pacific International Exposition in 1915. The information deals largely with the distribution of ownership of forests, production of the forests, and the utilization of various forest species.

Forest products on farms (*5. Census of Canada, 5 (1915), pp. V–VII*).—Tabular returns secured in the Fifth Census of Canada are given, showing the quantity and value of forest products cut on the farms in Canada for the year 1910. The total value of the forest products for all occupied farm lands was $35,024,429.

DISEASES OF PLANTS.

A bibliography of recent literature concerning plant disease prevention, C. C. REES and W. MACFARLANE (*Illinois Sta. Circ. 183 (1915), pp. 1–78*).—The authors, in compiling this bibliography, have made an attempt to include references to all the articles relating to plant diseases in which control measures are given, abstracts of which have appeared in the Experiment Station Record during the years 1909 to 1914, inclusive, more than a thousand citations being given.

A bibliography of nonparasitic diseases of plants, C. W. LANTZ (*Illinois Sta. Circ. 183 (1915), pp. 79–111*).—In preparing this bibliography, the author has attempted to present a list of nonparasitic diseases of plants with reference to the more important literature on these diseases. The different diseases are listed under the common names of the plants upon which they occur, the host plants being alphabetically arranged.

Report of the microbiologist, S. F. ASHBY (*Ann. Rpt. Dept. Agr. Jamaica, 1915, pp. 29–31*).—It is stated that the Panama disease of bananas persists in some localities, appearing to be spread by human agency (on the feet, tools, diseased plants, etc.). Bonnygate disease shows little tendency to spread beyond areas subject to periodic flooding. Blackhead disease of the bulb and roots has been found in most cases examined to be due to a nematode, said to be identical with *Tylenchus biformis*. A brown rot of leafstalks is ascribed to a bacterium which gains entrance at injuries due to wind when abnormal weather has weakened the plants. A heart rot, which was promoted by the checking of growth during wet weather, is thought to be caused by the same bacterium found in bud rot of coconut.

Sporadic cases are noted of coconut bud rot, which is thought to be favored by the weakening influence of drought. Destruction of the trees and replanting

are considered necessary. Leaf dieback, due primarily to drought, was not entirely controlled by the removal of the affected parts and the use of Bordeaux mixture. Cases of root disease were observed on badly drained land and on impervious clay subsoils. "Eaten leaf" disease, due to fungus attack in the bud, requires the introduction of a fungicide into the crown of the trees. A bud rot trouble was thought to be due to *Phytophthora parasitica*, which is said not to have been recorded previously as a disease of the coconut.

P. faberi still causes considerable loss to cacao. Promising results in its control have been obtained with Bordeaux and with Burgundy mixtures. Some cases of pod anthracnose (*Colletotrichum cradwickii*) have been observed, and this is controlled in the same way.

Cases of gall or knot, due to *Sphæropsis tumefaciens*, were observed on limes. The remedy suggested is destruction by fire of all prunings.

A Sclerotium destroying the lower leafsheaths of sugar canes was noted in two places. It is thought that this may cause loss in wet seasons. The rind fungus (*Melanconium sacchari*) rotted prematurely ripened canes on one estate.

Mention is made also of a few insects injurious to coconut, cacao, citrus, mango, coffee, yams, sugar cane, and cotton.

Root knot or eelworm attacks new hosts, L. E. Melchers (*Ohio Nat., 15 (1915), No. 8, pp. 551–555, figs. 4*).—The author states that after contact with soil containing *Heterodera radicicola*, infection followed in the case of the hitherto unreported hosts *Vinca rosea, Chrysanthemum frutescens, Celosia empress, Matthiola incana annua*, and Phlox. Specimens of *Carum petroselinum* from Kansas were also badly affected with this nematode, not previously reported as parasitic thereon.

Control of yellow rust, F. Stranak (*Deut. Landw. Presse, 42 (1915), No. 42, p. 379*).—This is mainly a discussion of studies reported by several investigators regarding conditions apparently favorable or unfavorable to the development of *Puccinia glumarum* on wheat and measures for its control.

Weather and cultural conditions thought to be influential in this connection are discussed, including not only those during the spring growth of the crop (as daily fluctuations of temperature, etc.), but probably also some obtaining in the previous year. Lists are given of varieties found to be highly susceptible, moderately so, or resistant, and these are briefly discussed in connection with their several vegetating periods and morphological characters.

A bacterial disease of western wheat grass, P. J. O'Gara (*Science, n. ser., 42 (1915), No. 1087, pp. 616, 617*).—A description is given of an unusual type of bacterial disease found on western wheat grass (*Agropyron smithii*) in the Salt Lake Valley, Utah. The affected plants are said to be usually somewhat dwarfed, but the most striking characteristic of the disease is the presence of masses of surface bacteria which form a lemon-yellow ooze or slime. Sometimes this appears in small droplets, but often it is spread over the surface of the upper portion of the plant, including the sheath, upper internode, and inflorescence. The disease seems to be limited to the upper portion of the plant, not having been found on the roots or lower internodes and sheaths. When the bacterial slime hardens, it is said that it may be separated from the plant surface in the form of thin, lemon-yellow flakes. The injury to the plants is due to the bacterial growth which first develops conspicuously on the surface and later penetrates the interior tissues.

This disease is said to have many characteristics in common with the disease of orchard grass first described by Ráthay and later by Smith as due to *Aplanobacter ráthayi* (E. S. R., 30, p. 539).

Beet blight, R. E. Smith (*Abs. in Phytopathology, 5 (1915), No. 5, pp. 291, 292; Science, n. ser., 42 (1915), No. 1086, pp. 580, 581*).—The structure of dis-

eased beets and characteristics of the beet blight are discussed, and the possible connection of this disease with certain bacteria is pointed out. In the discussion following the paper it was stated that only insects which have been in contact with diseased beets are capable of transmitting the disease.

[Leaf spot of wild celery] (*Irish Nat., 23 (1914), No. 2, p. 48*).—Mention is made of the discovery by Pethybridge of a fungus on wild celery in the western part of County Galway, Ireland, thought to be identical with *Septoria petroselini apii* of cultivated celery. It is considered improbable that the disease could have spread to the wild plants from cultivated ones.

Inoculation studies are noted below.

The possible source of origin of the leaf spot disease of cultivated celery, G. H. Pethybridge (*Jour. Roy. Hort. Soc., 40 (1915), No. 3, pp. 476–480*).—The author reports that the fungus obtained from wild celery (see above), on which it caused a mild form of disease, produced in cultivated celery effects resembling in every way those of the well-known celery leaf spot. The reverse test was impracticable as the wild plants were already infected.

From this fact and a study of the parasite the author concludes that this fungus is identical with *Septoria petroselini apii* of cultivated celery and may be the original source of the infection, which is much more severe on cultivated than on wild celery.

Pathogenicity and identity of Sclerotinia libertiana and S. smilacina on ginseng, J. Rosenbaum (*U. S. Dept. Agr., Jour. Agr. Research, 5 (1915), No. 7, pp. 291–298, pls. 2, fig. 1*).—A report is given of studies made on the white rot of ginseng, previously attributed to *S. libertiana* (E, S. R., 27, p. 649), and of the black rot of gingseng, which has been reputedly caused by *S. panacis* (E. S. R., 27, p. 247).

The pathogenicity of the species of Sclerotinia causing both of these diseases has been established, and the one causing white rot is said to be identical with *S. libertiana* occurring on lettuce, celery, and a number of other host plants. The fungus causing the black rot has proved to be identical with *S. smilacina*, inoculations from ginseng to the original host plant, *Smilacina racemosa*, having given positive results.

Studies of the Rhizoctonia disease of potatoes, J. H. Corsaut (*Abs. in Phytopathology, 5 (1915), No. 5, pp. 293, 294; Science, n. ser., 42 (1915), No. 1086, pp. 582, 583*).—An account is given of studies on the potato disease due to Rhizoctonia in Oregon. Affected plants and tubers were secured from different localities and a large number of strains of the causal organism were isolated. The cultural characters of these strains were similar, although some variation was shown. A number of varieties of potatoes were inoculated with Rhizoctonia grown under similar conditions, and some varieties proved extremely susceptible while others were strongly resistant. This was also found true when the fungus was grown on sterile plugs of raw potatoes. By artificial means healthy Rhizoctonia-free potato plants were made to reproduce both the "aerial potato" and "little potato" conditions. These experiments are thought to indicate that the abnormal effects are secondary results of Rhizoctonia attack caused by interference with the normal process of food storage in the plant.

Diseases of sugar beets, O. Fallada (*Österr. Ungar. Ztschr. Zuckerindus. u. Landw., 44 (1915), No. 1, pp. 1–13*).—This communication follows the same general plan as that of the previous year (E. S. R., 31, p. 543).

Besides discussions of weather conditions and injurious animals, mention is made of root rot, noted principally on the darker soils, *Clasterosporium putrefaciens* in the leaves, and *Phoma betæ* in both leaves and roots.

Scald of tobacco plants by Paris green, L. P. de Bussy and P. A. Dietz (*Meded. Deli-Proefstat. Medan, 9 (1915), No. 1, pp. 15–25*).—It is stated that the degree of injury due to leaf scald as the result of using Paris green on tobacco plants in Deli appears to increase somewhat in proportion to the amount of free arsenious acid present therein. Other factors mentioned are mechanical injury to the tender moist leaves, and excessive quantity or lack of uniformity of the arsenical sprays. It is suggested that careful preliminary tests be made with gradually increasing percentages of the preparation.

The bacterial bloom and twig blight of fruit trees, A. Osterwalder (*Landw. Jahrb. Schweiz, 29 (1915), No. 1, pp. 29, 30*).—It is stated that in 1912 a variety of pear was severely injured by a bacterial invasion of the blooms, extending to the twigs, which also quickly withered and died, the effects resembling somewhat those due to *Monilia fructigena*. It is thought that the disease may be similar to the pear blight in America caused by *Bacillus amylovorus*, but complete identification of the organism has not yet been found possible.

Studies of Monilia blight of fruit trees, G. B. Posey (*Abs. in Phytopathology, 5 (1915), No. 5, p. 294; Science, n. ser., 42 (1915), No. 1086, p. 583*).—The author reports the isolation from blighted twigs of apricot, prune, and pear of a species of Monilia apparently unlike, in cultural characters, the common brown-rot fungus of the stone fruits due to *Sclerotinia cinerea*, which is abundant in Oregon. An investigation of this blight-producing Monilia has been undertaken, and more than 50 strains have been isolated and comparative studies made with *S. cinerea* from different parts of this country and with *S. fructigena* from England. The culture studies and inoculations indicate that the organism in question is apparently an unrecognized species of Monilia entirely distinct from *S. cinerea* and *S. fructigena*.

The investigations thus far show that this fungus is apparently common in the Northwest, where it has been found on blighted blossoms, spurs, and twigs, and on mummied fruits of pear, quince, apricot, peach, prune, plum, and cherry. It usually starts in the spring as blossom blight and works back into the spurs and branches, where the progress of the fungus is checked as the season advances. No ascospore stage of the fungus under investigation has been found, although apothecia of the common *S. cinerea* were collected on various mummied fruits.

Bacterial canker of cherry and filbert disease, H. P. Barss (*Abs. in Phytopathology, 5 (1915), No. 5, p. 292; Science, n. ser., 42 (1915), No. 1086, p. 581*).—The author calls attention to the identity of the cause of bud blight and body canker of cherry trees, an account of which has been previously given (E. S. R., 32, p. 644), and to the bacterial disease of filbert which has already been described (E. S. R., 32, p. 647).

The utilization of certain pentoses and compounds of pentoses by Glomerella cingulata, L. A. Hawkins (*Amer. Jour. Bot., 2 (1915), No. 8, pp. 375–388; abs. in Phytopathology, 5 (1915), No. 5, p. 294; Science, n. ser., 42 (1915), No. 1086, p. 583*).—A report is given of experiments made to determine the effect of the apple bitter-rot fungus upon the pentose-containing compounds of the apple fruit, the relative value of certain pentoses and compounds of pentoses as sources of carbon for this fungus, and the effect of an aqueous extract of the fungus mycelium upon xylan.

It was found that the fungus increased the alcohol-soluble pentosan content of the apple fruit, but decreased the total pentosan content. It readily utilized either xylose, arabinose, xylan, or arabin as sources of carbon. The two pentoses were more favorable sources of carbon than glucose. Aqueous extracts of the fungus mycelium when allowed to act on xylan produced xylose, and

it is considered that the fungus secretes an enzym which hydrolyzes xylan to xylose.

Apple mildew, W. S. BALLARD (*Abs. in Phytopathology, 5 (1915), No. 5, p. 292; Science, n. ser., 42 (1915), No. 1086, p. 581*).—Efforts which have been made to control this disease are referred to, including the use of colloidal sulphur, prepared by dissolving sulphur in melted resin, grinding, and putting into ammonia water, as well as some of the difficulties involved in the use of sulphur and the reasons for the use of dilute sprays.

Coryneum fruit spot of apricots, J. T. BARRETT (*Abs. in Phytopathology, 5 (1915), No. 5, p. 293; Science, n. ser., 42 (1915), No. 1086, p. 582*).—A description is given of this disease, which is said to be not so widely distributed on apricots as was supposed. Spraying operations carried out for its control have not been satisfactory in all cases.

An established Asiatic Gymnosporangium in Oregon, H. S. JACKSON (*Abs. in Phytopathology, 5 (1915), No. 5, p. 293; Science, n. ser., 42 (1915), No. 1086, p. 582*).—The author reports the results of studies and inoculations with a newly imported Gymnosporangium discovered on oriental pears in Oregon.

Observations on prune rust (Puccinia pruni-spinosæ) in southern California, J. T. BARRETT (*Abs. in Phytopathology, 5 (1915), No. 5, p. 293; Science, n. ser., 42 (1915), No. 1086, p. 582*).—This fungus is said to be serious at times in southern California on apricots and peaches. In some cases early fall pruning has stimulated fall growth in which foliage stays alive through the winter, and rust development in this foliage has caused early spring infection with very detrimental effects to orchards.

A Nectria and its Fusarium generation on raspberry roots, A. OSTERWALDER (*Landw. Jahrb. Schweiz, 29 (1915), No. 1, pp. 30, 31*).—It is stated that the fungus, *N. rubi*, noted as apparently parasitic on roots of the raspberry (E. S. R., 26, p. 450) has been studied in pure cultures and by means of infection tests on healthy roots both wounded and uninjured, but without result as regards proof of its really parasitic activity. The author also notes the view of Wollenweber (E. S. R., 30, p. 537), according to which this fungus is classed as *Hypomyces rubi*.

Preliminary note on some sprays for American gooseberry mildew, J. M. HECTOR and S. J. M. AULD (*Gard. Chron., 3. ser., 58 (1915), No. 1493, pp. 79, 80*).—The authors state that under the conditions obtaining in these preliminary tests the action of American gooseberry mildew is checked by the use of colloidal sulphur (prepared by precipitating lime sulphur with acid in the presence of gelatin under suitable conditions), precipitated lime sulphur, various lime sulphurs, and soda. These sprays seemed also to delay the formation of the perithecia. The treatments are undergoing further trial.

Reports of the commission on control of American gooseberry mildew, W. T. C. VAN DOORN ET AL. (*Tuinbouw, 2 (1914), No. 36, pp. 429–431; 3 (1915), No. 27, pp. 301–304*).—Tests in 1914 with two preparations reported only by number, gave good results in reducing attack by American gooseberry mildew. The "California mixture" lessened attack, but the bushes suffered from leaf cast and the size of the fruits was decreased. A preparation designated as "Nasfa" lessened attack somewhat, but was associated with a characteristic form of injury.

The 1915 tests showed less favorable results from the first two preparations mentioned above.

Recent studies on infection of grape by Plasmopara (Peronospora) viticola, H. MÜLLER-THURGAU (*Landw. Jahrb. Schweiz, 29 (1915), No. 1, pp. 26–28*).—Reviewing the results of studies previously noted (E. S. R., 28, p. 244) tending to show that proper application of fungicides to the lower or stomatal

surface of the leaves gives complete protection from *P. viticola*, the author states as the result of recent studies that such application does not decrease sugar formation. A high degree of soil moisture rather disposes the plants to attack, but the leaves are not so influenced by atmospheric dampness during several days.

Injury to grape leaves by addition of sulphur to Bordeaux mixture, A. OSTERWALDER (*Landw. Jahrb. Schweiz, 29 (1915), No. 1, pp. 28, 29*).—It is stated that in the hot summer of 1911 the addition of from 2 to 3 per cent of sulphur to Bordeaux mixture used to spray grapevines caused a spotting or killing of the leaves. This was very pronounced in southern exposures and in general where the direct and reflected heat from the sun caused high temperatures. The injury was attributed to the formation of sulphuric acid under these circumstances.

Similar injury resulted, with formation of corky areas on the fruits, in cases where pulverized sulphur was applied after the use of Bordeaux mixture, and this was similarly explained.

Pythiacystis infection of deciduous nursery stock, ELIZABETH H. SMITH (*Abs. in Phytopathology, 5 (1915), No. 5, p. 291; Science, n. ser., 42 (1915), No. 1086, p. 580*).—A dieback of young deciduous trees, which has occurred extensively in northern California for several seasons, has been traced to a species of Pythiacystis morphologically identical with *P. citrophthora*, first described as causing a rot of lemons (E. S. R., 18, p. 344).

Most of the root stock is apparently immune to this fungus, but above the bud the bark is said to be affected, cankers being produced which often girdle the tree and kill back the whole top. Profuse gumming follows canker formation. The fungus has been isolated from peach, almond, pear, and plum, and the disease produced by inoculation in apple, pear, peach, almond, apricot, prune, and cherry. Similar cankers have been produced by inoculation with *P. citrophthora* isolated from lemon fruit.

A pythiaceous fungus has been isolated from almond cankers and successfully inoculated into almond, readily developing an oospore stage. This fungus has different characters of growth from the original strain and a less degree of pathogenicity, but it is believed that it will ultimately be placed in the same species.

Mottled leaf of Citrus species, J. T. BARRETT (*Abs. in Phytopathology, 5 (1915), No. 5, p. 292; Science, n. ser., 42 (1915), No. 1086, p. 581*).—Attention is called to the fact that no specific cause has as yet been discovered for this disease, which is still classed as nonparasitic. Affected leaves contain more startch than normally on account of defective translocation, and there is apparently also an excess of nitrogen. It is stated that some relation appears to have been discovered between fertilization with nitrate of soda without the addition of vegetable material and mottled leaf, but the author considers that this is probably not an effect of the materials used but of the soil conditions produced, since in plats in which liberal use of vegetable material had been made no mottled leaf appeared.

In connection with the discussion of this paper, F. S. Earle stated that there are probably two distinct types of mottled leaf in Cuba and the Isle of Pines, arising respectively from what is probably a specific disease of small roots and from general unfavorable soil conditions.

Citrus gummosis and melaxuma, H. S. FAWCETT (*Abs. in Phytopathology, 5 (1915), No. 5, p. 293; Science, n. ser., 42 (1915), No. 1086, p. 582*).—A description is given of the gummosis due to *Pythiacystis citrophthora*, and the melaxuma of walnuts which is caused by a fungus thought to be a species of Dothiorella.

Fruit stain and withertip of citrus, J. T. Barrett (*Abs. in Phytopathology, 5 (1915), No. 5, p. 293; Science, n. ser., 42 (1915), No. 1086, p. 582*).—The effect of the fungus *Colletotrichum glœosporioides* on citrus twigs and fruit is considered. The author states that as yet there is no evidence that the fungus is capable of infecting thoroughly sound and healthy tissue of leaves and twigs, but that it may infect fruit through germination from appressoria, killing small areas of rind. Later development of the fungus causes serious fruit rotting in addition to the tear-stain marks upon the surface.

Injury to orange trees due to nematodes, L. Trabut (*Compt. Rend. Acad. Agr. France, 1 (1915), No. 6, p. 222*).—It is stated that a study of orange trees showing decline in Algeria has led to the conclusion that the injury is due to a nematode, *Tylenchulus semipenetrans*, in the rootlets. Protective measures inaugurated include treatments with carbon bisulphid and sulphocarbonates and inspection of nursery stock.

The Sclerotinia disease of Campanula medium, A. Osterwalder (*Landw. Jahrb. Schweiz, 29 (1915), No. 1, p. 31*).—Observations during several years on *C. medium* affected with a wilt beginning about the time of blooming and resulting in the death of the plant have shown this disease to be due probably to *S. libertiana* attacking the plants near the surface of the soil, and suggesting that the overwintering sclerotia were the source of the attack. Early removal and destruction of affected plants is deemed necessary.

Iris leaf blotch disease, J. K. Ramsbottom (*Jour. Roy. Hort. Soc., 40 (1915), No. 3, pp. 481–492, pls. 7*).—Reporting a study of the leaf blotch of Iris due to *Heterosporium gracile*, and said to occur on many species, the author states that the affected leaf fades prematurely, thus shortening considerably its period of photosynthesis. The fungus may pass the winter in its fruiting form. The spores germinate after undergoing temperatures considerably below freezing.

Inoculations of living plants were successful, the germ tube passing through either epidermis or stomata. The resulting mycelium was either intercellular or intracellular, but possessed no haustoria. Narcissus was not attacked by this fungus.

Old leaves should be burned. Lime should be applied in autumn and forked into the soil in spring in case of soils deficient in that component.

Two eastern forest diseases which threaten the Pacific States, H. Metcalf (*Abs. in Phytopathology, 5 (1915), No. 5, p. 291; Science, n. ser., 42 (1915), No. 1086, p. 580*).—The author takes up the chestnut bark disease due to *Endothia parasitica* and the white pine blister rust caused by *Cronartium ribicola*, and indicates the danger of their introduction to the cultivated chestnut of the Pacific States, and to the valuable sugar pine (*Pinus lambertiana*) and the western white pine (*P. monticola*). He advocates a rigid state quarantine against the admission of nursery stock of the genus Castanea, the five-leaf species of pine, and the genus Ribes.

Two new hosts for Peridermium pyriforme, G. G. Hedgcock and W. H. Long (*U. S. Dept. Agr., Jour. Agr. Research, 5 (1915), No. 7, pp. 289, 290, pl. 1*).—The authors report the occurrence of *P. pyriforme* on *Pinus rigida* and *P. arizonica*, thus adding two new species to the known hosts of this fungus. It is claimed that *P. pyriforme* causes three forms of disease on pines, one with slight or no hypertrophy, common on *Pinus divaricata*, *P. pungens*, and *P. ponderosa scopulorum*; a second causing a fusiform or spindle-shaped swelling on *P. arizonica*, *P. contorta*, *P. divaricata*, *P. ponderosa*, *P. ponderosa scopulorum*, and *P. rigida*; and a third form causing the formation of globose galls now first reported on *P. contorta*.

ECONOMIC ZOOLOGY—ENTOMOLOGY.

The relation of rodent plague to human infection, W. C. RUCKER (*Jour. Amer. Med. Assoc., 65 (1915), No. 21, pp. 1767–1769*).—A review of the subject with references to the literature.

A plague-like disease of California ground squirrels affecting man in Ohio, W. B. WHERRY (*Jour. Amer. Med. Assoc., 65 (1915), No. 18, pp. 1549, 1550*).—This paper relates to investigations previously noted (E. S. R., 33, p. 450).

The author calls attention to recent experiments of N. E. Wayson showing that in addition to squirrel fleas (*Ceratophyllus acutus*), reported by McCoy and Chapin to be transmitters of the virus (E. S. R., 26, p. 461), the house fly and stable fly may transmit the virus shortly after feeding on an infected animal. In a discussion of the subject which follows (pp. 1549, 1550), N. E. Wayson reports having duplicated McCoy's methods of flea transmission of the disease without as successful results. When the stable fly was allowed to bite the infected animal and then transferred to a normal animal the results were successful in a small percentage of cases. House flies which were allowed to feed on and crawl over infected viscera and then over a cocainized eye yielded nearly 100 per cent of "takes." This method was positive in transmission even with a 24-hour interval between the exposure to the infection and to the normal eye. The discussion was also entered into by G. W. McCoy, N. Barlow, and the author.

Two years' investigations in Peru of verruga and its insect transmission, C. H. T. TOWNSEND (*Amer. Jour. Trop. Diseases and Prev. Med., 3 (1915), No. 1, pp. 16–32, pls. 2*).—This is a summarized account of investigations carried on by the author, accounts of which have been previously noted from other sources (E. S. R., 32, pp. 248, 350).

The establishment of foreign insects in spite of inspection, H. B. WEISS (*Canad. Ent., 47 (1915), No. 10, pp. 313–315*).—It is pointed out that in spite of inspection a number of insects have been introduced into New Jersey at Rutherford, where two large nurseries are located and where there were received during the spring of 1914 3,744 cases of imported nursery stock, during the following fall 1,765. and during the spring of 1915 2,191 cases. Among the species which have recently become established are *Phytomyza aquifolii*, found mining the leaves of English holly; the European pine shoot moth (*Evetria buoliana*) in *Pinus mughus* growing in the nursery; *Agrilis viridis fagi* infesting rose stems and doing considerable damage in this and other sections of the State; *Aspidiotus tsugæ* taken in considerable numbers on Japanese hemlock; *Myelophilus piniperda*, which does extensive damage to pine trees in Europe, found on *P. sylvestris;* and *Pseudococcus* sp., from Japan, found to damage *Taxus* sp.

Insect importations into New Jersey during the spring of 1915, H. B. WEISS (*Canad. Ent., 47 (1915), No. 10, pp. 326–328*).—The author presents a list of insects imported on nursery stock from various countries in Europe during the spring of 1915.

[Use of quassiin as an insecticide in Russia], A. V. ZEIDEL (*Otchet Dîeîa-teln. Kiev. Obshch. Selsk. Khoz. i Selsk. Khoz. Promyshch., 1913, p. 106; abs. in Rev. Appl. Ent., 3 (1915), Ser. A, No. 2, p. 104*).—Quassiin was found to be one of the most effective insecticides used against *Hyponomeuta malinellus.*

The mouth parts of the Thysanoptera and the relation of thrips to the nonsetting of certain fruits and seeds, A. D. BORDEN (*Jour. Econ. Ent., 8 (1915), No. 3, pp. 354–360, figs. 9*).—Anatomical studies of the Thysanoptera and observations of their feeding habits are reported.

An interesting case of antennal antigeny in Thysanoptera, J. D. Hood (*Proc. Ent. Soc. Wash., 17 (1915), No. 3, pp. 128–132, figs. 4*).—The genus Plesiothrips is erected for *Sericothrips ? perplexa*.

Further experiments in the control of the tarnished plant bug (Lygus pratensis), M. D. Leonard (*Jour. Econ. Ent., 8 (1915), No. 3, pp. 361–367*).—In continuation of investigations previously noted (E. S. R., 31, p. 650) the author records tests made of the effectiveness of excluding tarnished plant bugs from nursery blocks by means of wire screen fences, of bagging, and of pruning.

Note on the life history of Enchenopa binotata (Membracidæ) on the butternut, W. D. Funkhouser (*Jour. Econ. Ent., 8 (1915), No. 3, pp. 368–371*).—This membracid is said to occur in abundance on the butternut in the vicinity of Ithaca, N. Y.

An investigation of the best methods of destroying lice and other body vermin, J. P. Kinloch (*Brit. Med. Jour., No 2842 (1915), pp. 1038–1041; abs. in Pub. Health Rpts. [U. S.], 30 (1915), No. 32, pp. 2287–2289*).—"Dry heat is more effective than moist heat in destroying lice and their eggs. The louse can be revived after immersion for one minute in water at 100° C. Exposure to a dry heat at the same temperature and for the same time appears to kill both lice and nits. The paraffin bodies are actively insecticidal, and of these petrol is the most effective. Lice and their eggs are destroyed by immersion in petrol for one minute, and they may be killed by exposure to the vapor of petrol for half an hour. Powerful fatty solvents other than the paraffins are actively insecticidal. Benzene, toluene, and acetone are as toxic to lice as petrol. Certain chlorin derivatives of methan, ethane, and ethylene are more lethal to lice than any other substances, and have the important merit of being noninflammable. Immersion in the chlorin derivatives of ethane and ethylene immediately destroys all lice and nits, and exposure to the vapor of these substances for five minutes is equally destructive. Even soap solutions containing 2 per cent of trichlorethylene or 10 per cent of tetrachlorethane are capable of killing in half an hour at ordinary temperatures all lice and nits.

"A 25 per cent solution of dichlorethylene or trichlorethylene in vaselin when applied to the human body has been found capable of exerting its insecticidal action for hours. The action of a 25 per cent solution of petrol in vaselin is of shorter duration, but is also effective for some hours.

"The common phenol disinfectants in their usual degrees of dilution for disinfectant purposes and at ordinary temperature fail to kill lice or nits, even after steeping for half an hour, but become efficient as insecticides if the temperature of the steeping tank is maintained at 65°.

"The volatile oils have no direct insecticidal effect. In a moist vapor of oil of wintergreen, oil of cloves, oil of caraway, oil of turpentine, oil of eucalyptus, oil of thyme, etc., lice live for many hours at body temperature, and can be revived after immersion in these oils.

"Over solid substances, such as iodoform, camphor, and paraform, and in contact with them, and in contact with garments impregnated with sulphur, borax, black hellebore, alum, etc., lice appear to remain practically unaffected."

Miscellaneous aphid notes, chiefly from Oregon, H. F. Wilson (*Trans. Amer. Ent. Soc., 41 (1915), No. 2, pp. 85–108, pls. 7*).—Life history notes on *Prociphilus fraxini-dipetalæ* are first presented. This aphidid, first located by the author at Washington, D. C., on roots of white pine (*Pinus strobus*), was later found to develop upon *Fraxinus* sp. He has since worked out the relationship on *F. oregona* and *Pseudotsuga taxifolia* in Oregon. In the spring it appears on leaves of the ash, causing them to curl and assume a gall-like forma-

tion. The young aphidids, which become mature about the last of May, usually disappear about the first week in June, supposedly to the roots of Douglas fir. In the fall part of the aphidids leave the roots and migrate to the ash and produce the sexual forms.

A second species which has been imported into Oregon on red and white ash has been identified by the author as *P. bumeliæ*. Descriptions of the various stages of *P. fraxini-dipetalæ* are presented, followed by a list of the Aphididæ infesting sage brush (*Artemesia* sp.) in Oregon, consisting of 13 species, 6 of which are described as new, and by descriptions of 9 additional new species of aphidids, 7 of which are from Oregon.

Confusion of Rhopalosiphum hippohæs and Myzus braggii, C. P. GILLETTE (*Jour. Econ. Ent., 8 (1915), No. 3, pp. 375–379, figs. 21*).—The difference in these aphidid species is pointed out.

A schizoneuran migrating from elm to the apple, A. C. MAXSON (*Ent. News, 26 (1915), No. 8, pp. 367, 368*).—The author presents evidence to show that the migration of the elm cluster or elm rosette aphid to the apple takes place in Colorado. He concludes that *Schizoneura lanigera* and the elm cluster louse are the same, the latter being the spring form of the former.

The woolly aphis as a pear pest, G. P. WELDON (*Mo. Bul. Com. Hort. Cal., 4 (1915), No. 9, pp. 441–444, figs. 2*).—Since August, 1913, when the woolly aphis was found abundant at Martinez, Cal., on the roots of seedling trees in the nursery row as well as on old trees of the Bartlett variety near by, investigations throughout the State have shown that there are few places where it does not occur. In some of the mountain districts of the State at least its presence has resulted in quite severe injury to trees.

Effect of low temperature on the oyster-shell scale (Lepidosaphes ulmi), R. L. WEBSTER (*Jour. Econ. Ent., 8 (1915), No. 3, pp. 371–375, figs. 3*).—The author's studies indicate that a temperature of —32° F. was too cold in Iowa during the winter of 1912–13 for the eggs of the oyster-shell scale to survive.

The Bermuda grass Odonaspis, J. KOTINSKY (*Proc. Ent. Soc. Wash., 17 (1915), No. 3, pp. 101–104, figs. 2*).—*Odonaspis ruthæ*, which infests Bermuda grass (*Cynodon dactylon*) in Honolulu, living mostly underground on the stem, is described as new.

Notes on the brown lace-wing (Hemerobius pacificus), G. F. MOZNETTE (*Jour. Econ. Ent., 8 (1915), No. 3, pp. 350–354, pl. 1*).—A more detailed account than that previously noted (E. S. R., 32, p. 651).

This lace-wing was found to be particularly important in destroying the oviparous females of the rosy apple aphis (*Aphis sorbi*) and the currant aphis (*Myzus ribis*). However, this species preys upon almost all species of Aphididæ, and during July, 1913, it was found quite abundant in hopyards feeding upon the wingless females of the summer generations of the hop aphis and also on the red spider of the hop (*Tetranychus telarius*). The larval period was found to average 14 days. The life cycle at a temperature ranging from 60 to 80° F. during the day and from 40 to 50° at night required an average period of 38 days. Five larvæ observed from December 11 to December 18 consumed from 24 to 27 aphidids each, or a total varying from 191 to 216 each.

A new species of Stenares, N. BANKS (*Proc. Ent. Soc. Wash., 17 (1915), No. 3, pp. 144, 145*).

The pupal instar of the fruit-tree leaf-roller (Archips argyrospila), G. W. HERRICK and R. W. LEIBY (*Canad. Ent., 47 (1915), No. 6, pp. 185–187*).—A tabular record of 227 pupæ under observation during June and early July shows the minimum length of the pupal instar to be 9 days and the maximum 16 days, with an average of 12.6 days.

Another migratory moth, J. R. WATSON (*Ent. News, 26 (1915), No. 9, pp. 419–422*).—This article relates to the noctuid moth *Anticarsia gemmatilis*, the caterpillars of which are great pests of the velvet bean and also attack the kudzu vine and horse bean in Florida.

It appears that the damage to the velvet bean in the Miami section begins in July, at least six weeks earlier than at Gainesville, which is near the northern limit of its occurrence in the larval stage. Records show the migration of the adult to the Northern States to be somewhat similar to that of the cotton leaf worm. It is thought to be quite certain that it does not ordinarily winter over even in central Florida but works northward from the southern part of the State.

Some notes on the activities of egg parasites of the codling moth in Turkestan, N. N. TROITSKII (*Trudy Pervago Vseross. Sïezda Dïeîatel. Prikl. Ent., Kiev, 1913, pp. 135–139; abs. in Rev. Appl. Ent., 3 (1915), Ser. A, No. 5, p 241*).—Examinations made in 1913 of various orchards in Turkestan led to the discovery of several parasites of the eggs of the codling moth in addition to (*Pentarthron*) *Trichogramma carpocapsæ*. Amongst these N. Kurdiûmov has identified the following: *T. embryophagus* in Tashkend, *T. semblidis* ? (*minutum* ?) in Tashkend, and *Trichogramma* sp. in Ferghana and Samarkand, where *T. carpocapsæ* was absent.

Poisoned bait for cutworms, E. H. STRICKLAND (*Canad. Ent., 47 (1915), No. 7, pp. 201–204*).—Experimental control work during the past two years with *Porosagrotis orthogonia* and *Euxoa ochrogaster*, and again during the present spring upon a species of Chorizagrotis, have shown shorts to be far more valuable than bran for use in a poisoned bait.

Notes on Anopheles production from a malarial survey, H. R. CARTER (*Amer. Jour. Trop. Diseases and Prev. Med., 2 (1915), No. 12, pp. 753–758*).—This paper deals with the relation of foul and clear water to breeding different kinds of mosquitoes, season and districts of breeding of *Anopheles punctipennis*, collections of water not producing Anopheles yet showing Anopheles larvæ, and complete and incomplete breeding places.

The rôle of Anopheles punctipennis in the transmission of malaria, W. V. KING (*Science, n. ser., 42 (1915), Nos. 1094, pp. 873, 874; 1096, pp. 934, 935*).—The author has demonstrated, through feeding experiments, that *A. punctipennis* is an efficient host for tertian malaria. It is pointed out, however, that this does not necessarily indicate that it is an efficient carrier of other forms of malaria, and that the investigations of Hirschberg indicate that it is not.

Mosquito eradication and prevention, with special reference to the malaria-bearing or Anopheles mosquito, W. D. WRIGHTSON (*Amer. Jour. Trop. Diseases and Prev. Med., 2 (1915), No. 12, pp. 738–752, figs. 9*).—Methods of controlling mosquitoes are dealt with.

A contribution to the life history of the corn-feeding syrphus fly (Mesogramma polita), C. H. RICHARDSON (*Jour. Econ. Ent., 8 (1915), No. 3, pp. 338–342, pl. 1*).—The author reports studies made during the course of an infestation by this fly which extended over a considerable portion of 200 acres of sweet corn at Jobstown, N. J., during the summer of 1913. Adults and larvæ were found to feed on pollen, but no deleterious effects upon the corn were observed.

An eastern Chilosia with hairy eyes, R. C. SHANNON (*Proc. Ent. Soc. Wash., 17 (1915), No. 3, p. 168*).

On the reproductive and host habits of Cuterebra and Dermatobia, C. H. T. TOWNSEND (*Science, n. ser., 42 (1915), No. 1077, pp. 253–255*).—Upon dissecting a female specimen of *Cuterebra cuniculi* the author found the uterus to contain well over 5,000 eggs, and perhaps nearer 10,000.

"The presence of the incubating uterus, enveloped with tracheæ, indicates that the egg is held within the fly until the maggot is well formed. . . . As far as Cuterebra is concerned, we can feel quite confident that its host relation is maintained through stealth, and that, barring accidents, the fly never comes in contact with the host. The eggs are probably deposited in the burrows or runways of the rabbits, rats, and other small mammals which it parasitizes."

Notes on the habits of Dermatobia follow.

Commensalism in Desmometopa, F. Knab (*Proc. Ent. Soc. Wash., 17 (1915), No. 3, pp. 117–121*).—Attention is called to the fact that agromyzids of the genus Desmometopa feed on the juices of insects freshly killed by other rapacious arthropods with which they are associated.

Flies which cause myiasis in man and animals.—Some aspects of the problem, F. C. Bishopp (*Jour. Econ. Ent., 8 (1915), No. 3, pp. 317–329*).—A review of the subject with references to the literature.

An experiment with Stomoxys calcitrans in an attempt to transmit a filaria of horses in the Philippines, M. B. Mitzmain (*Amer. Jour. Trop. Diseases and Prev. Med., 2 (1915), No. 12, pp. 759–763, pl. 1*).—One hundred and fifty-four stable flies which had engorged upon a horse, the blood of which showed as many as 12 microfilariæ in a single field under a low-power microscope, were applied daily for 42 days to four normal horses. Blood examinations for the presence of microfilaria gave negative results for all four animals. The greatest death rate among the infested flies was during the first ten days, i. e., during the period when development of the microfilariæ took place in their bodies.

The effect of various chemicals on blowfly, W. F. Cooper and W. A. B. Walling (*Ann. Appl. Biol., 2 (1915), Nos. 2–3, pp. 166–182*).—The authors report upon experiments conducted at the Cooper Laboratory for Economic Research, Watford, England, with the object of determining the insecticidal value of various chemicals, a large number of which have never been actually employed as insecticides. The results are presented in detail in tabular form. The general summary drawn by the authors is as follows:

"Of substances repellent to the blowfly and therefore capable of protecting sheep from their ravages, the following appear to be the most suitable: Methyl salicylate, *p*-nitranilin, picric acid, creosote, green oil, boric acid, fusel oil, pine oil, alizarin oil, origanum oil, mustard oil, sod oil, iodoform, dimethylanilin, quinolin, allyl alcohol, aloin, saponin, copper carbonate, nitrobenzene, sinapis oil, and aniseed oil.

"For the application of toxic agents, a powder form has been found to be very convenient and efficient, precipitated chalk forming a suitable and cheap basis. The substances, applied in this form, which appear to be most toxic to the blowfly larva, comprise the following: Arsenic sulphid, nitrobenzene, eucalyptus oil, methyl salicylate, cedarwood oil, *p*-nitranilin, β-naphthylamin, oxalic acid, borax, quinolin, allyl alcohol, picric acid, dimethylanilin, copper carbonate, oil of cloves, turpentine, β-naphthol, creosote, fusel oil, sinapis oil, aniseed oil, and iodoform. Since the young larvæ are much more susceptible than the old, in field work, the medicated powder should be applied either previous to, or in the very earliest days of, the larval stage.

"Various vapors have been shown to be toxic to the blowfly larvæ, and of these the most successful are brombenzene, chloral hydrate, ethyl acetate, iodin, and pyridin."

The habits, life history, and structure of a bloodsucking muscid larva (Protocalliphora azurea), A. F. Coutant (*Jour. Parasitology, 1 (1915), No. 3, pp. 135–150, figs. 7*).—The author reports upon studies at Ithaca, N. Y., of the

larva of this dipteran, which occurs as a normal bloodsucking parasite of nesting birds, with fatal results in some cases. The structure of the larva and of the pupa are described, as are the habits and distribution of the adult.

A list of 9 references is appended.

Revision of Myiophasia, C. H. T. TOWNSEND (*Proc. Ent. Soc. Wash., 17 (1915), No. 3, pp. 107-114*).

A new nocturnal species of Tachinidæ, W. R. WALTON (*Proc. Ent. Soc. Wash., 17 (1915), No. 3, pp. 162-164, figs. 3*).

A new and interesting genus of North American Tachinidæ, W. R. WALTON (*Proc. Ent. Soc. Wash., 17 (1915), No. 3, pp. 104-107, figs. 6*).—A tachinid reared at Pasadena, N. J., from undetermined grasshoppers is described as *Coquillettina plankii* n. g. and n. sp.

Some muscoid synonyms, C. H. T. TOWNSEND (*Ent. News., 26 (1915), No. 10, p. 366*).

Kerosene traps as a means of checking up the effectiveness of a poisoned bait spray to control the Mediterranean fruit fly (Ceratitis capitata), with a record of beneficial insects captured in the kerosene, H. H. P. and H. C. SEVERIN (*Jour. Econ. Ent., 8 (1915), No. 3, pp. 329-338, pl. 1*).—This paper is in continuation of investigations previously noted (E. S. R., 32, p. 153).

Life history, natural enemies, and the poisoned bait spray as a method of control of the imported onion fly (Phorbia cepetorum) with notes on other onion pests, H. H. P. and H. C. SEVERIN (*Jour. Econ. Ent., 8 (1915), No. 3, pp. 342-350*).—This paper reports upon studies made in Wisconsin of the life history of *P. cepetorum*, its natural enemies, probable causes of its enormous increase, and the poison bait spray for it. In addition brief notes are presented on the black onion fly (*Tritoxa flexa*), barred-winged onion fly (*Chætopsis ænea*), *Euxesta notata*, onion thrips, cutworms, miscellaneous insects injurious to onions, and insects bred from decayed onions.

The number of eggs which are laid at one deposition may vary from 1 to 15. Under field conditions the incubation period of eggs deposited by the first brood of *P. cepetorum* in early June varied from 3 to 4 days. The larval period was completed in from 2 to 3 weeks in green onions, onion sets, and small seeded onions, but in seeded onions from the previous year the development of the maggots was often prolonged and, in some instances, required from 4 to 5 weeks. The pupal period under field conditions required from 9 to 16 days during the latter part of June and early July, the majority of the second brood of flies emerging in 11, 12, and 13 days. They were found to develop in radishes and in manure. The period of emergence of the second brood of onion flies under field conditions extended from June 28 to July 25, most of the flies issuing from July 1 to July 12.

The rove beetle *Aleochara anthomyiæ* is said to be the most important enemy of this pest in Wisconsin. A report of the results of control work with the poison bait spray, by Sanders, has been noted (E. S. R., 33, p. 357).

Concerning a new enemy of the carob bean in Italy, Eumarschalia gennadii, G. DEL GUERCIO (*Redia, 9 (1913), No. 2, pp. 227-232, figs. 3; abs. in Rev. Appl. Ent., 3 (1915), Ser. A, No. 1, p. 55*).—A dipteran, thought to be *Schizomyia gennadii*, for which the author erects the subgenus Eumarschalia, is said to have attacked the carob bean in Italy since 1904. In some districts from 50 to 60 per cent of the crop is affected. Control consists in the collection of injured beans toward the end of summer, just before harvesting, and placing in an oven or boiling water.

The influence of Oscinis frit on the growth and yield of summer-sown cereals, E. M. VASSILIEV (*Reprint from Iuzh. Russ. Selsk. Khoz. Gaz., 1914, pp. 17; abs. in Rev. Appl. Ent., 3 (1915), Ser. A, No. 3, pp. 147, 148*).—Work with

the frit fly in Petrograd in 1911 indicates that the application of a mineral fertilizer will overcome its injury to oats to a considerable extent.

A new species of Mycetaulus, N. BANKS (*Proc. Ent. Soc. Wash., 17 (1915), No. 3, p. 145*).

A revision of the North American species of Pachybrachys, H. C. FALL (*Trans. Amer. Ent. Soc., 41 (1915), No. 3, pp. 291–486*).—A revision of the chrysomelid genus Pachybrachys. The author recognizes 159 species, of which 73 and a number of varieties are described as new to science.

A review of Henriksen's cerambycid larvæ in Danmark's Fauna, Biller III, Traebukke, 1914, F. C. CRAIGHEAD (*Proc. Ent. Soc. Wash., 17 (1915), No. 3, p. 127*).

Recent ladybird introductions, H. S. SMITH (*Mo. Bul. Com. Hort. Cal., 4 (1915), No. 11, pp. 523–525, figs. 3*).—The introduction of two valuable ladybird beetles, *Chilocorus bipustulatus* and *Exochomus quadripustulatus*, from Italy into California during the summer just past is recorded.

Borers of fruit trees, canes, and vines, M. P. SOMES (*Missouri Fruit Sta. Bul. 25 (1915), pp. 3–23*).—A brief account is given of the more important insect borers of fruit trees, canes, and vines, their life histories and habits, together with a key for their identification and a host list.

Life history and control of Agrilus hastulifer, E. V. ZVIEREZOMB-ZUBKOVSKY (*Abs. in Rev. Appl. Ent., 3 (1915), Ser. A, No. 5, pp. 227, 228*).—Since 1905, when this beetle was first reported as a forest pest in the Government of Kief, it has done considerable damage to oak and hornbeam each year in the forests of that government and of southwestern Russia.

Notes on Ipidæ with description of a new species, A. D. HOPKINS. (*Proc. Ent. Soc. Wash., 17 (1915), No. 1, p. 54*).—A new species collected from *Pinus radiata* and *P. contorta* from California to Idaho is described as *Ips* (*Tomicus*) *radiatæ*.

Observations on the metamorphosis of Dendrolimus pini, K. SHISHKIN (*Abs. in Rev. Appl. Ent., 3 (1915), Ser. A, No. 5, p. 227*).—A brief account based upon observations made during 1910, 1911, and 1912, in the Government of Poltava.

A new genus of scolytoid beetles, A. D. HOPKINS (*Jour. Wash. Acad. Sci., 5 (1915), No. 12, pp. 429–433*).—The genus Conophthorus, the type species of which is *Pityophthorus coniperda*, is characterized and brief descriptions given of a large number of new species.

A mechanical measure for controlling the flea-beetle (Epitrix fuscula) on potato, C. L. METCALF (*Jour. Econ. Ent., 8 (1915), No. 2, pp. 240, 241, pl. 1*).—The difficulty met with in controlling flea-beetles on potatoes by means of insecticides led the author to construct the trap here described. This consists of a box the inside of which is covered with a thin coat of tree tanglefoot. As the vines pass through the box from one end to the other the flea-beetles leave them and are caught by the tanglefoot.

Counts made of the number of insects caught by this trap showed flea-beetles to the number of 1,357 from one-twentieth of an acre, or at the rate of over 25,000 per acre, and the apple-leaf hopper at the rate of 40,000 per acre.

New records of the shot-hole borer, E. O. ESSIG (*Mo. Bul. Com. Hort. Cal., 4 (1915), No. 9, p. 445*).—The loquat is added to the list of fruit trees attacked by *Eccoptogaster* (*Scolytus*) *rugulosus*.

The uses of certain weevils and weevil products in food and medicine, W. D. PIERCE (*Proc. Ent. Soc. Wash., 17 (191), No. 3, pp. 151–154, fig. 1*).

The life history of Rhynchites auratus in Turkestan according to observations in 1912 and 1913, N. N. TROITSKIĬ (*Trudy Pervago Vseross. Sʺezda Dieiatel. Prikl. Ent., Kiev, 1913, pp. 131–134; abs. in Rev. Appl. Ent., 3 (1915),*

Ser. A, No. 5, pp. 240, 241).—The weevils appear early in April and first attack the blossoms of cherry trees, gnawing a hole in the side of the calyx and frequently penetrating into and destroying the ovary. In 1913 from 63 to 66 per cent of the blossoms were damaged in this way. When the young fruits appear the beetles feed exclusively on them, in 1913 74 per cent having been damaged in that stage. From 50 to 72 per cent of the eggs are parasitized by a chalcidid.

The secretions employed by Rhynchophorous larvæ in cocoon making, F. Knab (*Proc. Ent. Soc. Wash., 17 (1915), No. 3, pp. 154–158*).

The embryology of the honeybee, J. A. Nelson (*Princeton: University Press, 1915, pp. VI+282, pls. 6, figs. 95*).—Following a brief historical review the author deals with the subject under the headings of the organization of the egg; cleavage; formation and completion of the blastoderm; the germ layers; the amnion and the cephalo-dorsal body; general account of the development of the embryo, with especial reference to the external form; the nervous system; tracheal system, endoskeleton, and hypodermis; the œnocytes; muscles, fat body, and circulatory system; sex organs—ovaries; alimentary canal; yolk and yolk cells; duration and rate of development; and technique.

A bibliography of eight pages is appended.

The life and habits of bees, H. von Buttel-Reepen (*Leben und Wesen der Bienen. Brunswick: Friedr. Vieweg & Son, 1915, pp. XIV+300, pl. 1, figs. 60*).—The first part of this work (pp. 7–158) deals with the life history of bees, including the geographical distribution of the honeybee and its varieties and other species of Apis, polymorphism and morphology, parthenogenesis in the honeybee, biology, etc. The second part (pp. 159–256) deals with the general organization of the honeybee.

A 23-page bibliography and author and subject indexes are included.

Bee keeping: A discussion of the life of the honeybee and of the production of honey, E. F. Phillips (*New York: The Macmillan Co., 1915, pp. XXII+457, pls. 8, figs. 180*).—In the preparation of this handbook the author has made use of the information gained in investigations of bees and bee culture by the Bureau of Entomology of this Department, of which work he is in charge.

The subject is dealt with under the following chapter headings: Bee keeping as an occupation, apparatus, the colony and its organization, the cycle of the year, the life of the individual in relation to the colony, the life processes of the individual, the nervous system and the senses, the reproductive processes and parthenogenesis, races of bees, regional differences within the United States, the first steps in bee keeping, the apiary site, the manipulation of bees, spring management, swarm control and increase, the production of extracted honey, the production of comb honey, marketing the honey crop, the production and care of beeswax, the care of bees in winter, the sources of nectar and pollen, bee diseases and enemies, the rearing of queens, and miscellaneous information.

Notes on Bombidæ, with descriptions of new forms, H. J. Franklin (*Ent. News, 26 (1915), No. 9, pp. 409–417*).—Supplementary to the work previously noted (E. S. R., 30, p. 59).

A new Diastrophus on strawberry, W. Beutenmuller (*Canad. Ent., 47 (1915), No. 11, pp. 353, 354, fig. 1*).—A cynipid which forms galls on the petioles of strawberry at Toronto, Canada, and elsewhere, is described as *Diastrophus fragariæ* n. sp.

Notes on the strawberry leaf petiole gall (Diastrophus fragariæ), A. Cosens (*Canad. Ent., 47 (1915), No. 11, pp. 354, 355, fig. 1*).—Brief notes are presented on the strawberry gall described above.

Some generic corrections in the Ophioninæ, S. A. Rohwer, A. B. Gahan, and R. A. Cushman (*Proc. Ent. Soc. Wash., 17 (1915), No. 3, pp. 149, 150*).

A few notes on the habits of parasitic Hymenoptera, W. D. PIERCE and R. A. CUSHMAN (*Proc. Ent. Soc. Wash., 17 (1915), No. 3, pp. 164–167*).

Descriptions of new Ichneumonidæ and taxonomic notes, R. A. CUSHMAN (*Proc. Ent. Soc. Wash., 17 (1915), No. 3, pp. 132–142*).—This paper consists largely of descriptions of new species of economic importance, together with notes on previously described species and genera. Among the new species of importance are *Calliephialtes thurberiæ* from *Anthonomus grandis thurberiæ* in the Santa Rita Mountains, Arizona; *Trematopygus eriocampoididis* from *Caliroa* (*Eriocampoides*) *cerasi*, and *Omorgus tortricidis* from *Polychrosis viteana* at North East, Pa.; and *O. phthorimæa* from *Phthorimæa operculella*, at Pasadena, Cal. The genus Prosmoridea is erected for *Prosmorus elongatus*.

The genus Secodella in North America, J. C. CRAWFORD (*Proc. Ent. Soc. Wash., 17 (1915), No. 3, pp. 142–144*).—The author recognizes five species, of which four are described as new to science, namely, *Secodella cushmani* from *Polychrosis viteana* at North East, Pa.; *S. acrobasis* from *Acrobasis nebulella* at Monticello, Fla.; *S. rugosus* from Oswego, N. Y.; and *S. viridis* from an unknown locality.

An insect enemy of the four-lined leaf bug (Pœcilocapsus lineatus), C. R. CROSBY and R. MATHESON (*Canad. Ent., 47 (1915), No. 6, pp. 181–183, figs. 4*).—The larva of a hymenopteran found at Ithaca, N. Y., to burrow through the pith of Weigelia stems until it reaches a row of eggs of *P. lineatus* and then to eat and destroy them, is described as *Cirrospilus ovisugosus* n. sp.

A new genus and species of Trichogrammatidæ from the Philippines, A. A. GIRAULT (*Canad. Ent., 47 (1915), No. 7, pp. 233, 234*).—*Pseudobrachsticha semiaurea*, reared from the eggs of *Hilda breviceps* at Los Baños, Philippine Islands, represents a new genus and species.

Further data on the life economy of the chinch bug egg parasite, J. W. McCOLLOCH and H. YUASA (*Jour. Econ. Ent., 8 (1915), No. 2, pp. 248–261, figs. 3*).—A detailed report of life history studies of *Eumicrosoma benefica*, a brief account of which has been previously noted (E. S. R., 31, p. 354). Collections of eggs were made in 16 localities in Kansas during July and August, and the average parasitism for the State, exclusive of Manhattan, was 14.5 per cent.

New species of Aphidiinæ, a subfamily of plant lice parasites, H. L. VIERECK (*Mo. Bul. Com. Hort. Cal., 4 (1915), No. 5–6, pp. 285, 286*).—The two new plant lice parasites here described, namely, *Ephedrus æstivalis* and *Monoctonus secundus*, make a total of 11 species of the subfamily recorded from California.

A new species of Campoplex, H. J. FRANKLIN (*Ent. News, 26 (1915), No. 8, pp. 356, 357*).—*Campoplex variabilis*, which was found to parasitize from 25 to 30 per cent of the larvæ of *Epelis truncataria faxonii* at Wareham, Mass., is described as new to science.

The peculiarities of development of Collyria calcitrator, N. V. KURDIUMOV (*Trudy Pervago Vseross. Sĭezda Dĭeiatel. Prikl. Ent., Kiev, 1913, pp. 94–96; abs. in Rev. Appl. Ent., 3 (1915), Ser. A, No. 5, p. 237*).—This ichneumonid, one of the principal parasites of the wheat sawfly (*Cephus pygmæus*) and frequently destroying 75 per cent of its larvæ, has been found through experiments at the Poltava Station to oviposit in the egg of its host. The egg of the parasite develops very slowly and produces a larva in the body of the larva of the host, where it winters and destroys its host the following spring.

A destructive pine sawfly introduced from Europe (Diprion [Lophyrus] simile), W. E. BRITTON (*Jour. Econ. Ent., 8 (1915), No. 3, pp. 379–382, pl. 1*).—This important European sawfly has been found to occur on pine in nursery at New Haven, Conn., where it appears to have become established.

A remarkable new genus of Cephidæ, S. A. Rohwer (*Proc. Ent. Soc. Wash., 17 (1915), No. 3, pp. 114–117, figs. 5*).—The new genus and species here described as *Syntexis libocedrii* was reared from larvæ and pupæ collected in the cells near the outer surface of the wood of a large incense cedar (*Libocedrus decurrens*) at Rose Camp, Cal.

Pneumonyssus foxi n. sp., an arachnoid parasitic in the lung of a monkey (Macacus rhesus), F. D. Weidman (*Jour. Parasitology, 2 (1915), No. 1, pp. 37–45, pl. 1*).—The new species here described, tentatively placed in the genus Pneumonyssus, is the fifth arachnoid species described from the air passages of the monkey.

Fragmentary notes on the life history of the myriapod, Spirobolus marginatus, H. S. Barber (*Proc. Ent. Soc. Wash., 17 (1915), No. 3, pp. 123–126*).

Migrating armies of myriapods, H. S. Barber (*Proc. Ent. Soc. Wash., 17 (1915), No. 3, pp. 121–123*).

Some new gregarine parasites from Arthropoda, Minnie E. Watson (*Jour. Parasitology, 2 (1915), No. 1, pp. 27–36, pls. 2*).—Three species of gregarines in Diplopoda, 9 in Coleoptera, and 5 in Orthoptera, one of which represents the new genus Leidyana, are described as new to science.

FOODS—HUMAN NUTRITION.

Digestibility of some animal fats, C. F. Langworthy and A. D. Holmes (*U. S. Dept. Agr. Bul. 310 (1915), pp. 23*).—This bulletin reports the results of a study of the digestibility of lard, beef fat, mutton fat, and butter. The subjects of the experiments, normal young men, were fed a basal ration, with which were incorporated the fats to be studied. Test periods included 3 days, or 9 meals, of the ration containing the fat studied. The average amounts of fat eaten per subject per day were as follows: Lard, 90 gm.; beef fat, 100 gm.; mutton fat, 53 gm.; and butter, 100 gm. The amount of protein consumed was somewhat lower than that specified in dietary standards, but this amount was a matter of personal choice.

"The values for the digestibility of the carbohydrate content of the diets were 96, 97, 97, and 96 per cent [respectively, for lard, beef fat, mutton fat, and butter] . . .

"The average energy value available per man per day as calculated by the usual factors and the coefficients of availability found in the digestion experiments was 2,235 calories for the lard, 2,730 calories for the beef fat, 2,145 calories for the mutton fat, and 2,420 calories for the butter diet. These energy quantities would be insufficient for severe muscular activity, but should meet the needs of those following sedentary occupations."

From the close agreement of the average coefficients of availability of energy calculated for the rations it is concluded that "the different fats did not exercise any unusual effect upon the digestibility of the other constituents of the rations."

The coefficients of digestibility of the fats studied after allowance had been made for metabolic products were as follows: Butter fat, 97 per cent; lard, 97 per cent; beef fat, 93 per cent; and mutton fat, 88 per cent. From a comparison of these coefficients with the melting points of the fats it is concluded that the fats of a low melting point are capable of a more complete assimilation than those of a higher melting point.

"In the beef-fat experiments, in which approximately 140 gm. of fat were consumed per day, the subjects reported a tendency toward a laxative condition, which was not noted when the amount of fat consumed was decreased. As

no such condition resulted from eating the other fats, it would seem from the information at hand that the limit of tolerance for these may have been higher than for beef fat."

Similar experiments are being carried on with other culinary and table fats.

The water content of meat products, E. SEEL (*Chem. Ztg., 39 (1915), Nos. 66, pp. 409, 410; 69, pp. 431, 432*).—A controversial article. On the basis of the analysis of a large number of samples of sausage, the author disagrees with Feder (E. S. R., 32, p. 252) and concludes that the ratio number 3.5 is more nearly correct than 4.0 for denoting the relative amounts of water and "organic nonfat" in chopped meats.

Farinaceous milks, GOBERT (*Ann. Falsif., 8 (1915), No. 79–80, pp. 165–170*).—The Swiss Codex defines farinaceous milks as preparations composed of a desiccated mixture of milk and of cereal or legume flour, the starch of which has been rendered as soluble as possible. Analyses were made of three products of this type to determine the percentages of water, fat, reducing sugars, cane sugar, casein, and other soluble and insoluble matter present. The only one of these products having the composition considered by the author ideal contained 4.1 per cent of fat and 6 per cent of casein.

Baking qualities of flours from grades of wheat from the Canadian Western Provinces, R. HARCOURT (*Jour. Soc. Chem. Indus., 34 (1915), No. 15, pp. 821, 822*).—The results are reported of baking tests with flour produced in an experimental mill from several different grades of wheat grown in western Canada in the years 1911 to 1914. The factors studied included the percentage of wet gluten and water absorption, the weight and size of the loaf, and the color, texture, and appearance of the bread.

Baking without grain flour, W. OSTWALD and A. RIEDEL (*Chem. Ztg., 39 (1915), No. 85–86, pp. 537, 538, figs. 5*).—Baking tests are described which were made with potato and tapioca flours used singly or mixed in equal proportions, and to which in some cases were added potato-flour paste and baking powder, or milk and yeast, a little sugar and salt, and in one case eggs. The best results were obtained with the potato flour and paste, to which milk and yeast were added.

Conserves for the army, MOUSSU (*Compt. Rend. Acad. Agr. France, 1 (1915), No. 23, pp. 668–677*).—A summary and digest of experimental data consisting in part of the report of Piettre, which describes the composition of several meat and vegetable products intended for army use and outlines the technique employed in preserving vegetables both alone and with meat.

The composition of frozen oranges and lemons, H. D. YOUNG (*Jour. Indus. and Engin. Chem., 7 (1915), No. 12, pp. 1038–1041*).—Considerable data are reported regarding the effect of freezing on the composition of the juice of oranges and lemons. The factors determined were the specific gravity and acidity of the fruit and of the fruit juice, and the sugar content of the juice. Samples of both frozen and unfrozen fruits were examined, some having been picked at short intervals and others shortly after having been frozen and then stored. The results are summarized by the author as follows:

"The principal change caused in citrus fruits by freezing is an excessive loss of moisture. This is shown by a marked lowering of specific gravity.

"The percentages of sugar and acid decrease slightly but definitely.

"Since the change in the composition of the juice is slight, its edible qualities are not impaired if it is not frozen so severely as to cause it to dry up."

Certain sanitary aspects of candy manufacture, E. H. CUMMINS (*Amer. Jour. Pub. Health, 5 (1915), No. 11, pp. 1148–1163*).—This investigation was carried out to determine the death rate of different pathogenic bacteria in

candy. Information of a general nature is given regarding the importance of the confectionery industry and its sanitary aspects. Only chocolate-coated candies were considered. The methods of their manufacture are discussed briefly in so far as they influence the sanitary quality of the finished product. Some data are given showing the bacterial content of various raw materials used in the manufacture of chocolates.

In the experiments a mixture of sugar, chocolate, and milk powder was prepared. After being sterilized, portions of this were inoculated with cultures of the different types of bacteria to be studied. The inoculated portions were stored at approximately 20° C. (68° F.) and samples taken from them at stated intervals for bacteriological examination. The organisms used were *Bacillus typhosus, B. coli, B. pertussii*, and *B. tuberculi*.

A study of the effect of hand and machine methods of dipping chocolates upon the bacterial content showed that in almost every instance machine-dipped chocolate contained less bacteria than did hand-dipped ones. Little or no increase in the number of bacteria originally present took place in the case of the machine-dipped chocolates.

In general it was found that the raw materials, especially the chocolate, are the sources of a large number of the bacteria present in chocolate candies.

The experiments with *B. pertussii* (the organism of whooping cough) showed that within a few hours after inoculation these organisms ceased to be present in the candy. In the opinion of the author there is little possibility of the transmission of this disease by candy infected in the factory. Although the results obtained with the tubercle bacillus are regarded by him as unsatisfactory, they indicated a very slight possibility of the tubercle bacillus surviving for a long time in chocolate. After a long period of storage it was possible to isolate the typhoid organisms from the inoculated candy, and the results indicated that there is a possibility of typhoid being transmitted through infected candy in case a worker should be a carrier. It was found also that the organisms of the colon type survived for a long time, and the results of the experiments indicated that after being inoculated into candy these organisms would probably find their way into the body through this source.

The death rate of the organisms seemed to be somewhat related to the amount of water present in the candy. In a candy of high-water content the bacteria died out faster than in a candy of low-water content. The author states that a continuance of this work is being carried on.

[Food and drug inspection], E. F. LADD and ALMA K. JOHNSON (*North Dakota Sta. Spec. Bul., 3 (1915), No. 22, pp. 369–392*).—This bulletin reports the results of the sanitary inspection of a number of establishments where foods are manufactured and sold, including stores, hotels, restaurants, etc. The scores of the places are given. Data are also given regarding the inspection of a number of foods and patent medicines.

The metabolic relationship of the proteins to glucose.—III, Glucose formation from human proteins, N. W. JANNEY and N. R. BLATHERWICK (*Jour. Biol. Chem., 23 (1915), No. 1, pp. 77–80*).—From the results of experiments with phlorizinized dogs fed protein in the form of human muscle the conclusion is drawn that not more than about 60 per cent of body protein can be converted into glucose. This corresponds to a urinary G:N ratio of about 3.4:1. For earlier work in this series see a previous note (E. S. R., 33, p. 868).

The injurious effect of an exclusive oat diet, leading to an acid poisoning, A. MORGEN and C. BEGER (*Hoppe-Seyler's Ztschr. Physiol. Chem., 94 (1915), No. 5–6, pp. 324–336*).—Feeding experiments with laboratory animals (rabbits)

were conducted by the authors for the purpose of determining the influence on metabolism of ingesting an exclusive oat diet. The animals receiving a pure oat diet lost weight steadily and finally became emaciated and anemic. The addition of dicalcium phosphate or sodium chlorid did not improve this condition, but when calcium carbonate or sodium bicarbonate were added to the diet the rabbits gained in weight and ate a constant or increasing amount of the oat ration. The conclusion is drawn that acid poisoning is the cause of the harmful action—that the oat diet does not supply sufficient basic mineral matter to neutralize the acids formed in the process of digesting the oats.

Experimental treatment of human beri-beri with constituents of rice polishings, R. R. Williams and N. M. Saleeby (*Phillipine Jour. Sci., Sect. A, 10 (1915), No. 2, pp. 99–118, pls. 2*).—Clinical observations are reported of 27 cases of human beri-beri, some of which were treated with allantoin, others with hydrolyzed extract of rice polishings, and the rest with unhydrolized extract. The authors' conclusions follow:

"Allantoin has a beneficial effect in certain cases of beri-beri, although probably never amounting to a complete cure. Its value should be tested further.

"Hydrolyzed extract of rice polishings has benefited all the types of beri-beri upon which it has been tried. It can be of practical service, but should be used only in cases under the direct supervision of physicians and nurses. Unhydrolyzed extract of rice polishings is a safe and valuable remedy for infantile beri-beri, but is of little use for older cases.

"The vitamin of rice polishings possesses specific and prompt curative properties far beyond those of any other known substance. Unfortunately, its cost at present prohibits its general use among the poorer classes, who are the chief sufferers from beri-beri.

"As a whole, the observations . . . are in accord with the broad proposition that the disease, in a practical sense at least, results primarily from a poor diet, deficient more particularly in specific substances of the nature of Funk's vitamin."

The nature of the dietary deficiencies of rice, E. V. McCollum and Marguerite Davis (*Jour. Biol. Chem., 23 (1915), No. 1, pp. 181–230, figs. 42*).—In extension of earlier work (E. S. R., 33, pp. 367, 465) the authors conducted a series of feeding experiments with laboratory animals (rats) to study the food properties of polished and unpolished rice, as well as the supplementary relationship between rice and certain naturally occurring food substances. The methods of preparation of the extracts employed in the experiments are described, and curves are given showing the growth of the rats in each experiment. The results of the work, which are reported in detail, may be summarized briefly as follows:

These experiments show that "there are necessary for normal nutrition during growth two classes of unknown accessory substances, one soluble in fats and accompanying these in the process of isolation of fats from certain foodstuffs, and the other soluble in water, but apparently not in fats." This water-soluble accessory is also soluble in alcohol.

It is also evident that "purified proteins, fats having the growth-promoting property, and salt mixtures of appropriate composition, can not adequately supplement polished rice so as to produce a diet which will support growth. . . . Unpolished rice is so supplemented by additions of purified foodstuffs as to make a food mixture which supports normal growth. . . . The inorganic content of polished rice has been closely imitated by suitable additions of salts and free mineral acids in a ration derived from milk powder and dextrin and in one from desiccated egg and a dextrin, without causing any loss of growth-promoting power of the food mixture.

"Polished rice does not exert a toxic effect on animals even when it constitutes as much as 80 to 90 per cent of the food mixture. Simple mixtures of rice and egg, rice and milk powder, rice and wheat embryo, carrying such a content of rice, have proved perfectly satisfactory for growth and for prolonged well-being.

"The addition of quantities of wheat embryo or of milk powder as small as 2 per cent of the food mixture, consisting aside from these constituents of polished rice, casein, salt, and milk fat, furnishes enough of an essential accessory to induce growth.

"The essential accessory substance, aside from that carried by milk fat, is present in water and in alcoholic extracts of wheat embryo and of egg yolk. The accessory substance which is soluble in water and in alcohol is stable to heat. Prolonged boiling does not injure it to a noticeable degree.

"The amounts of water extract (freed from protein by coagulation) which we have found necessary to supply enough of the water-soluble accessory to induce normal growth carry nitrogen equivalent to about 1 per cent of the total nitrogen of the ration. Amounts of alcoholic extract of wheat embryo carrying as litttle as 0.6 gm. of solids and 0.0095 gm. nitrogen (0.33 per cent of the total nitrogen of the ration) suffice to induce normal growth.

"The water-soluble accessory is not the same one as is furnished by milk fat. Twenty per cent of milk fat addition does not induce any growth unless the other accessory is supplied.

"Polished rice and salts, together with sufficient wheat embryo to supply liberal protein and water-soluble accessory additions, do not support growth. The fat-soluble accessory must likewise be supplied before growth can proceed."

The essential factors in the diet during growth, E. V. McCollum and Marguerite Davis (*Jour. Biol. Chem., 23 (1915), No 1, pp. 231–246, figs. 12*).—Feeding experiments with laboratory animals (rats) are described which are in continuation of the work mentioned above. The basal ration contained casein, from which all the water soluble constituents had been removed by dialysis, dextrin, a mixture of inorganic salts, and agar-agar. In some of the tests these substances alone in varying proportions made up the ration; in other experiments different amounts of butter fat were added; in others, the water and alcohol soluble extract of the wheat embryo; and finally both butter and water-soluble extract were incorporated in the diet.

From the results obtained the authors conclude that "certain at present unidentified substances aside from protein, carbohydrates, fats, and salts are indispensable for growth or prolonged maintenance, and furthermore there is a class of such accessories soluble in fats and another soluble in water and alcohol. From the data available . . . it seems highly probable that, while the amount of accessory substances of either of these classes which is required to induce growth is small, the evidence points to the belief that a certain quantity must be present before any growth can take place, and that above this amount growth seems to be in some measure proportional to the amount of accessories present.

"It is obvious that in the study of the relative values of isolated proteins fed with mixtures of purified food substances comparable amounts of these two classes of accessories must be supplied. Otherwise no safe interpretation can be put upon the results."

The cause of the loss of nutritive efficiency of heated milk, E. V. McCollum and Marguerite Davis (*Jour. Biol. Chem., 23 (1915), No. 1, pp. 247–254, figs. 6*).—In order to ascertain the factors involved in the loss of efficiency of milk by heating (which had been observed in the above experiments), additional feeding experiments with rats were conducted in which a basal ration

of polished rice, casein in varying amounts, milk fat, and a salt mixture was supplemented by the following heated preparations from milk: Milk from which the casein had been removed (whey), heated in the autoclave; milk from which the casein and albumin had been removed, boiled six hours; and lactose (heated in the autoclave).

The following summary of conclusions is given:

"Skim milk powder which has been wet and long heated in a double boiler or heated for a period of one hour in an autoclave at 15 lbs. pressure, no longer supports growth as does the unheated product. When heated, milk powder also loses its property of supplementing certain rations made up of polished rice, plus salts and milk fat: i. e., rations which require both protein and water-soluble accessory to make them support growth.

"Wheat embryo, which is as efficient as milk powder in supplementing such rice rations, can be heated for one hour in an autoclave at 15 lbs. pressure without manifesting any deterioration in this respect as does milk.

"Skim milk from which the casein has been removed (whey) can be heated in an autoclave at 15 lbs. pressure for one hour without noticeable loss of its nutritive properties. It still supplies the water-soluble accessary in active form.

"Whey from which the albumin has been removed by coagulation can be kept at the boiling temperature for six hours without any appreciable loss in its activity as far as the water-soluble accessory is concerned. Also lactose which has been heated in an autoclave for one hour at 15 lbs. pressure still behaves as does the unheated product in supplying to rations the water-soluble accessory.

"Heating casein in a moist condition for one hour in an autoclave at 15 lbs. pressure destroys its biological value as a complete protein. Heated casein or heated milk powder are shown to have little, if any, toxicity. The deterioration is due to a loss of value of the protein fraction of the ration through changes wrought in the casein."

The estimation of carbon dioxid tension in alveolar air, P. Roth (*Jour. Amer. Med. Assoc., 65 (1915), No. 5, 413–418, figs. 5*).—A method is described for obtaining samples of alveolar air. In the author's opinion, the carbon dioxid tension in alveolar air is a most valuable index of the intensity of acidosis in the body.

A text-book of military hygiene and sanitation, F. R. Keefer (*Philadelphia and London: W. B. Saunders Co., 1914, pp. 305+8, figs. 47*).—Though designed particularly for the use of those interested in problems of military hygiene, this book has much of interest to the student of home economics problems, as is shown by such chapter headings, as physical training, preventable diseases, clothing, water supply, foods and their preparation, and the disposal of wastes. The volume is based in considerable measure upon actual experience gained through a long period in promoting the physical condition, health, and fitness of soldiers, and deals primarily with measures which insure these results.

An improved respiration calorimeter for use in experiments with man, C. F. Langworthy and R. D. Milner (*U. S. Dept. Agr., Jour. Agr. Research, 5 (1915), No. 8, pp. 299–348, pls. 7*).—This paper describes the respiration calorimeter used for experiments with man in the Office of Home Economics, U. S. Department of Agriculture. Detailed descriptions are given of the construction of the respiration chamber, the methods and apparatus employed in the determination of the respiratory exchange, and the measurement of latent and sensible heat. An apparatus for measuring muscular work performed by

the subject of an experiment is also described and tests of the accuracy of the apparatus are reported. For the details of this report the original paper should be consulted. An appendix of cited literature is included.

For an earlier description see a previous note (E. S. R., 25, p. 570).

A respiratory chamber for small animals, A. C. Kolls and A. S. Loevenhart (*Amer. Jour. Physiol., 39 (1915), No. 1, pp. 67–76, figs. 8*).—Detailed descriptions are given of three respiratory chambers which are suitable for a study of the gaseous metabolism of small animals (dogs, rabbits, cats, rats, mice, etc.) It is possible to keep animals in these chambers for a week or more in a given atmosphere of oxygen and nitrogen, but they are not designed to measure energy exchange. For the details of construction, the original should be consulted.

ANIMAL PRODUCTION.

New literature, compiled by M. Daiber et al. (*Ztschr. Induktive Abstam. u. Vererbungslehre, 14 (1915), No. 2, pp. (1)–(34)*).—A bibliography of literature published during 1913, 1914, and 1915 on breeding, inheritance, and related subjects.

Some studies of environmental influence, heredity, correlation, and growth in the white mouse, F. B. Sumner (*Jour. Expt. Zool., 18 (1915), No. 3, pp. 325–432, figs. 17*).—In these studies about 2,300 animals were measured.

Certain differences were noted between the mean measurements of lots which were reared in a cold room and those reared in a warm room. As regards the tail and foot these differences were considerable in amount and of almost certain statistical significance. After the initial retardation of the cold-room animals in respect to tail length the tails grew faster, both relatively and absolutely, than those of the warm-room animals. In both lots the shorter tails grew, on the average, faster than the longer ones. There was a tendency toward compensation in growth, such as has been observed for the weight of guinea pigs.

References to the literature are appended.

Variability and amphimixis, L. B. Walton (*Amer. Nat., 49 (1915), No. 587, pp. 649–687, figs. 6*).—This is a report of a comparative study of the variability in zygospores of *Spirogyra inflata* formed by lateral (close breeding) and by scalariform (cross-breeding) conjugation, and its bearing on the theory of amphimixis and the problem of evolution. A bibliography is appended.

Effect of the popular sire, W. Haynes (*Jour. Heredity, 6 (1915), No. 11, pp. 494–496, fig. 1*).—In a statistical study of three varieties of terriers it was found that over 40 per cent of the puppies were sired by approximately 20 per cent of the stud dogs. It is thought that prepotency is especially strong in certain families and that this undoubtedly influences selection, but only indirectly. The reputation of the individual dog, both as a show winner and a sire of winners, is almost always the determining factor in a breeder's selection, but it is thought that it can hardly be a coincidence that in these three breeds popularity and prepotency should have been combined. The fact that artificial selection gives to certain selected, but not uniform, males an undue preponderance of influence, must always keep the type of domestic animals in an unstable state. This is thought to be an important factor in the great variability always noted among domesticated breeds.

Rabbit crossing, II, V. Haecker and Olga Kuttner (*Ztschr. Induktive Abstam. u. Vererbungslehre, 14 (1915), No. 2, pp. 49–70, pls. 3, fig. 1*).—An account of crossbreeding experiments with rabbits in a study of color inheritance.

Composition and digestibility of fresh grass and of hay dried naturally and artificially, F. HONCAMP (*Landw. Vers. Stat., 86 (1915), No. 3-4, pp. 215-276*).—In digestion trials with sheep to determine the relative digestibility of hays cured in various ways it was found that fresh grass and the resulting hay obtained by rapid desiccation in a vacuum apparatus had practically the same digestibility, while in naturally dried hay the digestibility was less. Ordinary drying of grass in the air and sun was always accompanied by a loss of nutritive substances even aside from possible mechanical loss. The fat content and its digestibility were unfavorably influenced by drying the hay under these conditions, probably due to the fact that certain substances soluble in ether and easy of digestion are entirely decomposed or converted into compounds that dissolve only with difficulty and are indigestible. Likewise the carbohydrates are easily decomposed in the natural drying process.

Artificial drying of grass at a low temperature, if ordinary precautions were taken, caused no material loss in digestible nutrients. Artificial drying of grass by means of air heated by direct fire, as in the case of the ordinary drying apparatus, was always accompanied by a decrease in the digestible protein material.

Soft corn ears for silage (*Better Iowa, 1 (1915), No. 30, p. 1*).—Successful experiments conducted at the Iowa State College in ensiling soft ears of corn in the late roasting stage are reported. The ears were finely chopped, packed tightly in small silos, and fermented for 12 days. The resulting silage was very good, having a favorable odor much like ordinary entire corn silage, and being bright, light colored, clean, free from mold, and palatable. Tests showed sufficient silage acids present to preserve without overacidity or sourness.

Ground nut cake (*Jour. Bd. Agr. [London], 22 (1915), No. 4, pp. 308-313*).—A general discussion of the feeding value of peanut cake, with a résumé of feeding experiments conducted in various countries.

Feeding stuffs inspection (*Maine Sta. Off. Insp. 72 (1915), pp. 101-196*).—Results of the inspection are reported, not as individual analyses, but in general findings for each brand as compared with its guaranties, and the various groups are discussed.

Inspection and analysis of feed stuffs, conditioners, tonics, etc. (In *Off. Rpt. on Feed Stuffs, [etc], 1914, Columbus, Ohio: Agr. Com. Ohio, Div. Agr., 1915, pp. 5-8*).—Analyses are given of bran, middlings, cotton-seed meal, oil meal, malt sprouts, meat meal, hominy feed, dried brewers' grains, tankage, meat scrap, blood tankage, corn gluten meal, alfalfa meal, screenings, dried beet pulp, red dog flour, and various mixed and proprietary feeds.

Commercial feeding stuffs, J. L. HILLS, C. H. JONES, C. G. WILLIAMSON, and G. F. ANDERSON (*Vermont Sta. Bul. 189 (1915), pp. 297-328*).—Analyses as to protein content are given of the following feeding stuffs: Cotton-seed meal, linseed meal, gluten feed, distillers' and brewers' dried grains, hominy feeds, provender, corn meal, dried beet pulp, alfalfa meal, meat scrap, cracked bone, bone meal, wheat bran, wheat middlings, red dog flour, and various mixed and proprietary feeds. A synopsis of the Vermont statute dealing with feeding stuffs is included.

Reorganization of the stock breeding department in Brazil (*Diario Off., Estad. Unid. Brazil, 56 (1915), No. 17, 29, 31; Bul. Off. Bur. Renseig. Brésil à Paris, No. 33 (1915), pp. 3-19; abs. in Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases, 6 (1915), No. 8, pp. 1079-1083*).—An account of the reorganization on January 27, 1915, of the stock-breeding work in Brazil into what is known as the department of pastoral industry. The duties of this

department as regards veterinary inspection of ports, importation of animals, registration of pedigree stock, and the federal stock-breeding stations are described.

Nutritive ratios for growing cattle, A. Gouin and P. Andouard (*Bul. Sta. Agron. Loire-Inf., 1912–13, pp. 35–40*).—A discussion of the Wolff-Lehmann and the Kellner tables, together with a summary of digestion experiments with young cattle. For maintenance requirements it is stated that 60 gm. of protein per 100 kg. of live weight is necessary, and in additon about 180 gm. of protein for each kilogram of gain in weight. In general a ration which contains 1 part of crude protein to 4 parts of nonnitrogenous elements seems to meet the requirements during active growth.

Changes in the blood of cattle due to the method of slaughter, G. Squadrini (*Mod. Zooiatro, Parte Sci., 26 (1915), No. 2, pp. 51–56*).—In experiments to determine the effect which the different methods of slaughter have upon the alteration of the blood of cattle, it was found that in shooting the coagulation of the blood is almost instantaneous, the rapidity being greater the less the time elapsing between shooting and bleeding. If the time between death and bleeding was as much as three or four minutes coagulation was delayed. The amount of fibrin in the blood was unchanged but the fibrin appeared to be not entirely normal. The other methods of slaughter tested had no abnormal effect upon the coagulation of the blood.

Features of the sheep industries of United States, New Zealand, and Australia compared, F. R. Marshall (*U. S. Dept. Agr. Bul. 313 (1915), pp. 35, pls. 8*).—The items discussed in this bulletin are the general conditions of sheep husbandry in New Zealand and Australia, the tenure of pastoral lands in these countries, flock management, breeds and types of sheep, shearing and wool classifying, expense of preparing wool for market, selling graded or classed wools in the United States, cooperative shearing sheds in New Zealand, education of wool growers and their employees, sheep raisers' organizations, and the probable extent of future importations of mutton and wool from Australasia.

The caracul sheep, the producer of "Persian lamb" and other furs of ovine origin, R. Wallace (*Abs. in Proc. Internat. Cong. Trop. Agr., 3 (1914), pp. 265–270*).—A discussion of the breed characteristics and of experiments in crossing this breed of sheep.

Difference in weight between raw and clean wools, W. S. Lewis (*Chem. Engin., 22 (1915), No. 5, pp. 197, 198*).—A number of fleeces carefully sampled and thoroughly cleansed of all grease and dirt showed average shrinkages of from 19.5 to 54 per cent, according to the breed of sheep.

In the South Australian wools the greatest shrinkage difference between two determinations upon samples drawn in the same manner from the same fleece was 3 per cent, while for the New Zealand wools the largest difference was 6 per cent. These differences were calculated on the basis of raw-wool weight.

The difference in shrinkage between two fleeces of the same breed of sheep grown in the same location was found to be as great as 9.5 per cent. The results of such tests upon 13 different breeds of sheep showed a mean variation of 4.5 per cent in the shrinkage.

Ancestry of the goat (*Jour. Heredity, 6 (1915), No. 11, pp. 519–524, figs. 3*).—A general résumé of the ancestry and later development of the goat, showing that modern breeds are all descendants of a single species. Breeding work has been along two general directions, to improve the yield of milk and to improve the yield of hair, considerable success having been attained along these lines.

Length of gestation period in Yorkshire sows, L. DASSOGNO (*Indus. Latt. e Zootec., 13 (1915), No. 12, pp. 180–182*).—An examination of 176 cases in Yorkshire sows showed a gestation period usually varying between 111 and 116 days, with the average 114 days. The longest period was 128 days, the shortest 106 days. The predominance of one sex in the offspring did not noticeably alter the length of the gestation period, nor did the size of the litter nor the shape and weight of the young pigs exert any influence upon it. The length of period did, however, vary with the age, vigor, and general condition of the sow, and more especially with the functioning of the ovaries.

Experiments in swine feeding, J. WITHYCOMBE, E. L. POTTER, and G. R. SAMSON (*Oregon Sta. Bul. 127 (1915), pp. 30*).—This bulletin summarizes the results of hog-feeding experiments conducted at the station since 1904, as previously noted (E. S. R., 16, p. 84).

In an experiment comparing chopped wheat and chopped barley two lots of 5 pigs each were fed for 75 days; the lot receiving the wheat made an average daily gain of 1.37 lbs. per head, and the lot fed the barley 1.35 lbs. The lots required 4.78 and 5 lbs. of feed, respectively, per pound of gain. It was found that while the barley proved superior to wheat during the first part of the test it did not do so well during the latter part. During the first part of the test the hogs ate more barley than wheat.

In an experiment comparing ground wheat, ground barley, and ground vetch seed 3 lots of 4 pigs each, fed for 61 days, made average daily gains per head of 1.3, 1.15, and 0.32 lbs., requiring 4.72, 5.34, and 9.63 lbs. of feed per pound of gain, respectively. In this test vetch seed proved very unpalatable and entirely unsuited for hog feeding.

In an experiment comparing skim milk and chopped wheat versus chopped wheat alone, 3 lots of 6 pigs each fed for 61 days, lots 1 and 2 receiving chopped wheat and lot 3 chopped wheat and skim milk, made average daily gains per head of 1.79, 1.61, and 2.58 lbs., respectively. Lot 1 required 4.24 lbs. of feed per pound of gain, lot 2, 4.4 lbs., and lot 3, 2.6 lbs. of feed and 5.59 lbs. of milk. In this test lot 1, which was fed on a plank floor, consumed 3.6 per cent less feed per 100 lbs. of gain than lot 2 which was on a dirt floor.

In an experiment comparing dry chopped barley, dry chopped wheat, and wet chopped wheat, 3 lots of 6 pigs each were fed for 77 days, with average daily gains per head of 1.015, 1.1, and 0.95 lbs., requiring 5.24, 4.69, and 4.55 lbs. of feed per pound of gain, respectively. In this test the advantage of wet wheat over dry was negligible.

Four lots of 7 pigs each were fed for 60 days, lot 1 receiving chopped barley, lot 2 chopped barley and skim milk, lot 3 chopped wheat, and lot 4 chopped wheat and skim milk. In this test the advantage of barley over wheat when fed alone was 12 per cent, and the advantage of wheat over barley when fed with skim milk, 13 per cent. To save 100 lbs. of barley it required 236 lbs. of skim milk, and to save 100 lbs. of wheat, 113 lbs. of skim milk. The cost per pound of gain was 5.44, 4.83, 6.11, and 4.28 cts. for the respective lots.

Four lots of 7 pigs each fed for 43 days, lot 1 receiving chopped barley, lot 2 chopped barley and skim milk, lot 3 chopped wheat, and lot 4 chopped wheat and skim milk, made average daily gains per head of 1.47, 1.86, 1.4, and 1.96 lbs., for the respective lots. Lot 1 required 4.01 lbs. of grain per pound of gain, lot 2, 2.97 lbs. of grain and 2.13 lbs. of skim milk, lot 3, 4.22 lbs. of grain, and lot 4, 2.82 lbs. of grain and 2.02 lbs. of skim milk. The advantage of barley over wheat when fed alone was 6 per cent. When fed with skim milk the advantage of wheat over barley was 5 per cent. The cost per pound of gain was 5, 4.24, 5.28, and 4.03 cts. for the respective lots.

Three sows fed 10 lbs. of kale per head daily for two months made a total gain per sow of 5 lbs. Ten lbs. of kale per day proved a bare maintenance for 265-lb. sows.

Two lots of 6 shoats each fed for two months, receiving kale and shorts and beets and shorts, respectively, made average daily gains per head of 0.29 and 0.16 lb. The gains were too slow to be considered satisfactory in either case.

Four lots of 4 pigs each fed for 60 days, lot 1 receiving chopped wheat and skim milk; lot 2, chopped wheat; lot 3, chopped barley and skim milk; and lot 4, chopped barley, made average daily gains per head of 1.95, 1.26, 1.91, and 1.59 lbs., respectively. The advantage of barley over wheat when fed alone was 20 per cent. The advantage of wheat over barley when fed with skim milk was 2 per cent.

Two lots of 6 pigs each fed for 60 days on grain, shorts, and chopped barley, lot 1 also receiving green alfalfa and lot 2 tankage, made average daily gains per head of 1.06 and 1.55 lbs., respectively. In this test 100 lbs. of tankage were equal to 30 lbs. of barley and 465 lbs. of green alfalfa. The lot on tankage showed better appetite throughout the test and was in better market condition at the close.

In this experiment two lots of 6 pigs each were fed for 60 days, lot 1 receiving wheat in a self-feeder and lot 2 being fed ground wheat in the usual manner. Lot 1 gained 0.612 lb. per head per day and lot 2, 0.847 lb., requiring 6.3 and 5.42 lbs. of wheat per pound of gain, respectively. The ready-ground wheat showed an advantage of 16 per cent in economy of gain and 37 per cent in rate of gain. Following the test both lots were fed on ground wheat and made practically the same gains.

Two lots of pigs on second-growth vetch pasture, lot 1 receiving shorts, barley, and skim milk and lot 2 shorts and barley, made average daily gains of 1.47 and 1.12 lbs., respectively. Lot 1 required 3.41 lbs. of grain and 6.57 lbs. of milk per pound of grain, and lot 2 5.14 lbs. of grain. This experiment indicated that second-growth vetch pasture during midsummer is not satisfactory as a supplement for grain in pig feeding.

Four lots of 7 or 8 pigs each fed for 62 days, lot 1 receiving shorts and ground wheat; lot 2, wheat and milk; lot 3, shorts and wheat; and lot 4, wheat and milk, made average daily gains per head of 1.21, 1.64, 0.69, and 1.52 lbs. for the respective lots, lot 1 requiring per pound of gain 1.45 lbs. of shorts and 2.90 lbs. of wheat; lot 2, 2.46 lbs. of wheat and 4.4 lbs. of milk; lot 3, 1.83 lbs. of shorts and 3.41 lbs. of wheat; and lot 4, 2.5 lbs. of wheat and 3.94 lbs. of milk. In this experiment lots 1 and 2 were crossbred and were very thrifty, while lots 3 and 4 were scrubs and greatly lacking in uniformity.

In a test to determine the cost of production two litters of crossbred Berkshire-Yorkshire pigs were used. It was estimated that the birth cost of each pig was 29 lbs. of grain, 65 lbs. of skim milk, and $\frac{1}{30}$ acre of pasture. This feed had a value of about 70 cts. After farrowing, these pigs were raised almost altogether on milk and grain. From birth to November 8, at which time they weighed 104 lbs. each, it required per pound of gain 2.28 lbs. of skim milk and 2.57 lbs. of grain, mostly shorts, this gain including the maintenance of the sow while suckling. It is estimated that it cost 4.24 cts. per pound of gain during this period, which, added to the birth cost, makes the total cost for each pig at 100 lbs. $4.94. These pigs were then divided into two lots, lot 1 receiving shorts and wheat and lot 2 skim milk and wheat. The cost per pound of gain was 6.09 cts. for lot 1 and 4.54 cts. for lot 2. The total feed cost of each 200-lb. finished pig fattened on shorts and wheat was $11.03 and for each pig fattened on skim milk and wheat $9.48.

Four lots of 6 pigs each fed 45 days, lots 1 and 2, hand fed, lots 3 and 5 fed by the self-feeder method, lot 1 receiving ground wheat and tankage, 92.8; lot 2, ground wheat; lot 3, ground wheat and tankage; and lot 4, ground wheat; made average daily gains of 0.65, 0.49, 0.76, and 0.61 lb. per head, respectively; lot 1 requiring 5.1 lbs. of the wheat and tankage mixture; lot 2, 6.7 lbs. of ground wheat; lot 3, 5.06 lbs. of wheat and tankage; and lot 4, 5.69 lbs. of ground wheat per pound of gain. The lots receiving the tankage gave better results. It was found, on the average, that 1 lb. of tankage saved 3.75 lbs. of wheat.

Two lots of pigs were fed for 62 days a mixture of grain and tankage, lot 1 being fed under shelter and lot 2 in a muddy lot. Lot 1 made an average daily gain per head of 1.44 lbs., requiring 3.33 lbs. of feed per pound of gain, and lot 2, 1.43 lbs. gain, requiring 3.39 lbs. of feed. From these results it appears that the two methods of shelter gave equally satisfactory results.

Two lots of 7 pigs each fed for 61 days, lot 1 receiving skim milk and barley, and lot 2 barley and tankage, made average daily gains of 1.57 and 1.43 lbs., lot 1 requiring 6.12 pounds of skim milk and 2.69 lbs. of barley and lot 2, 3.31 lbs. of barley and 0.35 lbs. of tankage per pound of gain. The test showed that under these conditions skim milk was 9 per cent better than tankage on the basis of the digestible nutrients contained, but that on a basis of the usual prices for each there was no difference in the economy of the two feeds.

Two lots of 7 pigs each fed for 59 days a mixture of wheat, shorts, and tankage 5:4:1, lot 1 being hand fed and lot 2 fed by the self-feeder, made average daily gains per head of 1.61 lbs. and 1.61 lbs., requiring 4.1 and 4.31 lbs. of feed per pound of gain, respectively. In a second experiment the hand-fed lot gained 1.24 lbs. daily and required 5.36 lbs. of feed per pound of gain, while the self-fed lot gained 1.62 lbs. and required 4.18 lbs. of feed. From records kept of the cost of production of two litters of Duroc-Jersey pigs it is estimated that the cost of production is 6.81 cts. per pound for a 100-lb. pig.

Three lots of 10 pigs each fed barley and tankage 9:1 for 61 days, lot 1 receiving dry feed, lot 2 being fed by the self-feeder, and lot 3 receiving soaked feed, consumed 6.88, 7.71, and 6.93 lbs. of feed per head per day and made average daily gains of 1.48, 1.82, and 1.54 lbs., requiring 4.63, 4.21, and 4.50 lbs. of feed per pound of gain, respectively. It appeared that the palatability of the ration was increased by soaking for 12 hours before feeding. In this test the best pig gained 2.44 lbs. daily during the period, while the poorest gained only 1 lb. daily. Both of these were barrows, but of the best 10 pigs 7 were barrows and 3 gilts. It was found that one-half of all the gilts in the test gained within 0.17 lb. of each other and were in the middle one-third when arranged in order of gains made. As many barrows as gilts were in the poorest one-third, and although there were but 14 barrows and 16 gilts in all, only 3 gilts got into the best ten. The cost per pound of gain of the self-feeder lot was 6.31, of the lot receiving the soaked ration, 6.65, and of the dry-ration lot, 6.82 cts. Were the labor item taken into account, it would make a still better showing for the self-feeder lot.

Two lots of 10 pigs each were fed barley and tankage 90.9:9.1 for 60 days, lot 1 receiving feed which had been soaked for 12 hours and lot 2 dry feed. These lots consumed 7.23 and 7.11 lbs. of feed per head per day, made average daily gains of 1.66 and 1.72 lbs. per head, and required 4.36 and 4.13 lbs. of feed per pound of gain, respectively. It is concluded from this test that with barley ground or crushed comparatively fine and mixed with tankage no saving is made by soaking the ration, or if any saving is made it is not sufficient to pay for the extra trouble and equipment required for soaking the ration.

In this test the average daily gain per head for the different litters varied from 1.2 to 1.91 lbs. Two of the 9 litters represented averaged less than the poorest lot, while one litter averaged better than the best lot. It is suggested that this shows the error of conclusion which may be drawn from feeding tests where small numbers are involved and no account is taken of the breeding of the animals under test. There was only a difference of 0.04 lb. gain daily in favor of the barrows. The best pig was a member of the best litter, and the poorest pig a member of the poorest litter.

Seventeen winter pigs were turned on an acre of clover pasture to determine whether clover is a profitable feed for pigs. They received in addition ground barley and tankage 92:8. During the 6-week period the pigs consumed 2 lbs. of feed per pound of gain. It is estimated that the clover used by these pigs during the 6 weeks would have the value of 366 lbs. of the grain mixture, valued at $5.40.

Two lots of 10 pigs each, which had been previously run on clover pasture, were fed for 44 days a mixture of barley and tankage 92:8, lot 1 being fed in the dry lot, and lot 2 on clover pasture. These lots made average daily gains of 1.545 and 1.909 lbs. per head, requiring 3.89 and 3.66 lbs. of feed per pound of gain, respectively. The pigs in the pasture lot ate more feed and made more gain. It appears that the clover saved 22.9 lbs. of grain in producing each 100 lbs. of pork.

Straw meal as a feed for pigs, BRAHM, R. VON DER HEIDE, and N. ZUNTZ (*Mitt. Deut. Landw. Gesell., 30 (1915), No. 16, 226–228*).—Straw meal mixed with gluten, sugar, molasses, or skimmed milk when fed to pigs showed a deficit in the nitrogen balance. Respiration calorimeter results demonstrated that the meal increased the work of digestion. By fermenting the fiber of the straw meal by means of bacterial action a high digestive coefficient was obtained, but in this experiment also the nitrogen balance showed a deficit. It is concluded that these results do not warrant the adoption of this method of feeding.

Elephant domestication in the Belgian Kongo, LAPLUME (*Proc. Internat. Cong. Trop. Agr., 3 (1914), pp. 352–354*).—A discussion of methods of domesticating and training the elephant for draft purposes.

Poultry investigations.—I, The value of meat scrap, fish scrap, and skim milk in rations for laying pullets, A. G. PHILIPS (*Indiana Sta. Bul. 182 (1915), pp. 837–856, figs. 4; pop. ed. pp. 4, fig. 1*).—In four experiments, each of one year's duration, four lots of single-comb White Leghorn pullets were fed a basal ration of corn, wheat, oats, bran, and shorts 10:10:5:5:5, lot 1 receiving in addition 3.5 parts of meat scrap, lot 2, 3.6 parts of fish scrap, lot 3, from 50 to 62 parts of skim milk, and lot 4 being used as a check lot.

It was found that the feeding value of meat scrap for Leghorn pullets was $23.92 per 100 lbs.; of fish scrap, $27.65 per 100 lbs.; and of skim milk, $2.04 per 100 lbs. When fed skim milk pullets laid slightly better in December and January. The meat-scrap pen averaged 135 eggs per pullet; the fish-scrap pen, 128 eggs; the skim-milk pen, 135.4 eggs; and the no-meat food pen, 32.5. The consumption of the meat-scrap pen was 70.29 lbs. of feed per fowl at a cost of 98.4 cts.; the fish-scrap pen, 74.13 lbs. of feed per fowl, at a cost of 99.5 cts.; and the no-meat food pen, 57.01 lbs. of feed per fowl, at a cost of 72.2 cts. The consumption of the skim-milk pen was 63.86 lbs., excluding the milk, or when the milk was included 157.61 lbs., at a cost of $1.10 per fowl. It costs an average of 8.5 cts. to produce one dozen eggs in the meat-scrap pen, and 9.7 cts. each in the fish-scrap and skim-milk pens.

The amount of dry matter to produce 1 lb. of eggs in the meat-scrap and skim-milk pens was 3.7 lbs. each, in the fish-scrap pen 4.02 lbs., and in the no-meat food pen, 13.53 lbs. Meat scrap, fish scrap, or skim milk thus greatly increased

the efficiency of the grain and dry mash feed. Meat scrap apparently produced slightly better fertility and hatchability of eggs than did the fish scrap or skim milk, but birds fed neither skim milk nor meat scrap showed slightly the best average fertility, and in two experiments the best hatchability. The profit in the meat-scrap pen was $1.55, in the fish-scrap pen $1.56, and in the skim-milk pen $1.62. Birds receiving neither meat scrap, fish scrap, nor skim milk were kept at a loss. At 30 cts. per 100 lbs., skim milk is considered slightly more expensive to feed than meat scrap at $2.50 per 100 lbs.

Leghorn pullets produced about 21 lbs. of manure at night a year.

The value of grit in poultry feeding, M. A. JULL (*Jour. Amer. Assoc. Instr. and Invest. Poultry Husb., 2 (1915), No. 2, pp. 14–16*).—Experiments are reported, the results of which point out the practical necessity of grit for the economical digestion of the whole grain by chickens, more efficient use being made of the feed when grit was fed. Chicks which received no grit consumed approximately 0.2 lb. more mash than did those to which grit was fed. The absence of grit had no diminishing effect on egg production, but the majority of the eggs were thin shelled and a few were soft shelled. There was apparently no relation of grit to the absorption of the yolk sack.

A comparison of digestible coefficients for cattle, swine, and poultry as suggesting a more accurate basis for computing poultry rations, A. B. DANN (*Jour. Amer. Assoc. Instr. and Invest. Poultry Husb., 2 (1915), No. 2, pp. 10–14*).—The author presents data tending to show that digestion by poultry is more nearly like cattle than it is like swine, but that poultry do not digest fiber. In view of these facts it is suggested that it might be advantageous at the present time to use the easily computed method of eliminating the fiber from the digested nutrients as obtained from experiments with cattle, and adopt these values in the computation of poultry rations.

A report of February hatched pullets, W. C. THOMPSON (*Jour. Amer. Assoc. Instr. and Invest. Poultry Husb., 2 (1915), No. 2, p. 16*).—It has been thought that the April hatching of Leghorns was the most economical practice, as early hatched Leghorns, on account of their development at 4½ months of age, usually went through a fall molt. In February, 1914, a large number of Leghorn eggs were hatched, from which on the first of August, 1914, were selected 200 good pullets. These were placed in a laying house and accurate records kept for one year.

It was found that the egg production during August, September, and October was more than enough to balance the decrease which took place in November and December, when the birds molted. The birds were fully matured and developed long before the cold winter set in, so that it was possible and practical to use their spring-laid eggs for hatching purposes, another distinct advantage of the early hatching of the Leghorn pullets.

Poultry husbandry, E. BROWN (*New York: Longmans, Green & Co., 1915, pp. XII+416, figs. 82*).—This book treats of the development of the poultry industry, and of methods of breeding, feeding, care, and management of poultry for market purposes.

Poultry and their diseases (*Bd. Agr. and Fisheries* [*London*], *Misc. Pub. 4 (1914), pp. 1–81, figs. 7*).—Information is given on methods of breeding, feeding, care, and management of poultry, ducks, and turkeys in England.

Feeding for egg production, H. L. KEMPSTER (*Missouri Sta. Circ. 76 (1915), pp. 12, figs. 2*).—This circular treats of the adaptability of various feed stuffs for poultry feeding and of methods of feeding. A number of rations for egg production are suggested.

Practical and inexpensive poultry appliances, J. E. DOUGHERTY and W. E. LLOYD (*California Sta. Circ. 142 (1915), pp. 22, figs. 18*).—A number of poultry

appliances, either designed or modified at the station, are described, including trapnests, hoppers, catching hook and coop, blood can, fattening crate, supply can, egg cabinet, sorting table, marking system for eggs, and an electric egg candler.

DAIRY FARMING—DAIRYING.

The ration and age of calving as factors influencing the growth and dairy qualities of cows, C. H. Eckles (*Missouri Sta. Bul. 135 (1915), pp. 3–91, figs. 27*).—From replies to questions sent out by the Missouri Station to dairy cattle breeders it appears that there is a wide range of opinion with reference to such points as relation of age at first calving to type, milking qualities and size, and the effect of heavy grain feeding during the period of growth upon size, milking qualities, and type. With a view to securing accurate data on these points, an investigation covering eight years' time and including 40 animals was conducted.

The 40 animals were divided into two main groups, one of which received a heavy ration from birth to first calving, the other group receiving a light ration. After the first calving both received a normal ration for dairy cows. The heavy ration consisted of whole milk during the first six months, and all the grain and hay the animals would consume up to the first calving. The light-fed group received skim milk during the first six months, and hay or pasture only after this age up to the first calving. The factor of age at first calving was introduced by having one-half of each of these two groups calve at an early age for the breed and the other half about a year later. Complete records of the feed received, growth as shown by monthly skeleton measurements and weighing, were kept from birth to maturity. Milk records were kept for each animal covering two or more lactation periods.

The heavy ration resulted in a more rapid growth of skeleton, especially during the period of most rapid development, but later the heavy ration resulted in the animals becoming much fatter. The animals receiving the light ration grew less rapidly, but growth continued longer, although this group never reached quite the size of those having the heavier ration when young. The difference between a heavy and light ration for growing heifers showed more strongly upon the weight than upon the rate of skeleton growth. It is suggested that one cause of small cows in commercial herds may be the character of the ration during the growing period.

It was found that age at first calving had a pronounced effect upon size of cows. Milk production is a severe tax upon the cow and checks growth to a marked degree, but gestation does not check the growth to any marked extent. The strongest factor tending to stunt the size of cows is scanty feeding during the growing period combined with early breeding. The time of sexual maturity of the animal is influenced to a considerable extent by the ration. Those receiving the heavy ration matured sexually at an age of from two to four months younger than those receiving the light ration.

The heifers receiving the heavy ration during growth were slightly inferior in milk production to those receiving the light ration. Apparently some detrimental effect upon the milking functions followed the use of the heavy grain ration, but it is not deemed probable that within the limits ordinarily found under practical conditions this factor would exert sufficient influence to be worth consideration. Some high-producing cows were found in each group and also some medium and some inferior. The data indicate that the factors which are the result of heredity, such as the influence of the sire and individuality of the animal, are the real determining factors with reference to the milking

functions of a cow. Inferior milk-producing cows are due mainly to inheritance rather than treatment received when young.

The experimental data given and a compilation of the records of the station herd for 22 years go to show that the highest milk production on the average is secured from cows well matured before lactation begins. The highest production among 95 cows was found to be from those calving between the ages of 28 and 32 months, the lowest for those calving under 20 months old.

Heavy feeding when young tended toward the development of larger and somewhat coarser animals than lighter rations. At the time of calving the conformation of the animal raised on a heavy grain ration was somewhat different from that of one raised on a ration of roughage. When both were placed on the same ration after calving this difference soon disappeared. Early calving tended toward a smaller and more refined type of cow than resulted from calving a year later.

The opinion of breeders that a heifer raised largely on roughage has a greater capacity for handling feed when mature was not substantiated by this investigation. A decided difference existed for a short time after calving but this gradually disappeared and no distinction between the two groups could be noted after two months. It was found that there was no difference in the amount of nutrients required to produce a pound of milk by animals of the two groups.

From these results it is concluded that it is possible to influence the rate of growth, size when mature, and type to some extent by the liberality of the ration during the growing period, and the age at first calving. Within limits of variation the character of the ration with reference to the amount of nutrients supplied does not exert any appreciable effect upon the milking functions of the cow when mature. The age at first calving is a factor of some importance with reference to the development of the milking function in the cow. Calving at an extremely early age is detrimental to the best development of the milking function while nothing is gained by too great delay.

The relative value of dairy feeds, E. S. Savage (In *Off. Rpt. on Feed Stuffs, [etc.,] 1914, Columbus, Ohio: Agr. Com. Ohio, Div. Agr., 1915, pp. 57–61*).—The author points out some discrepancies in the various feeding standards, and suggests the importance of securing a simple and reliable method of calculating the relative value of the different feed stuffs.

Physical conformation of cows and milk yield, J. A. Harris (*Jour. Heredity, 6 (1915), No. 8, pp. 348–350, figs. 3*).—The author comments on the data collected by Korreng (E. S. R., 28, p. 472), which indicated an intimate negative relationship between width of nether jaw of dairy cows and milk yield. It is suggested that Korreng's measurements were taken on a group of animals that are not racially homogeneous. A mixture of heavy beef cattle giving a low milk yield and light-built dairy cattle would theoretically give just such a result as this. The author warns against conclusions of this sort. What is really needed is a means of predicting yield from more readily measured characters within a pure race.

Results of milking at unequal periods (*Dairy, 27 (1915), No. 321, pp. 230, 231*).—The results of experiments conducted by D. A. Gilchrist at Armstrong College are cited, these demonstrating that the longer the period between milkings the poorer the quality of the milk. When the periods were approximately equal the quality of the morning's and evening's milk was very similar. The total quantity of milk appeared not to be influenced by the equal or unequal periods of milking.

Problems of the milk standard (*Dairy, 27 (1915), No. 322, p. 262*).—Data collected at the milk competition at the Royal Show at Nottingham showed a

significant variation between morning and evening milk. While the evening milk averaged 4 per cent of fat, the general average of the morning deliveries showed only 3.09, a dangerously narrow margin of safety. There was also found to be a wide difference in the milks of individual cows of the same breed. Among the Ayrshires one cow gave milk with 4.72 per cent of fat, while another gave milk with 2.97 per cent. From these observations it is concluded that with the unpreventable inequalities of high-quality milk there is danger of even the well-meaning producer being unjustly subjected to prosecution.

Angora and milch goats, S. H. Hopkins (*Brit. Columbia Dept. Agr., Live Stock Branch Bul. 64* (*1915*), *pp. 37, figs. 18*).—Information is given on the breeding, feeding, care, and management of Angora and milch goats.

Milk and milk products, C. Harrington, M. W. Richardson et al. (*In A Manual of Practical Hygiene. Philadelphia: Lea and Febiger, 1914, 5. ed., rev. and enl., pp. 98–189, pls. 4, figs. 7*).—A discussion of the composition and the physical and chemical characteristics of milk, butter, cheese, and other milk products, as related to human hygiene.

The reaction and calcium content of milk as factors in the coagulation process, T. H. Milroy (*Biochem. Jour., 9* (*1915*), *No. 2, pp. 215–228; abs. in Jour. Soc. Chem. Indus., 34* (*1915*), *No. 14, p. 813*).—During the coagulation of milk with rennin the acidity (hydrogen ion concentration) remained constant, but it was increased by adding calcium chlorid and lowered by adding an alkali oxalate. Fresh milk that had been preheated below the boiling point for one hour showed an increased acidity and, owing to the separation of tricalcium phosphate, a lower calcium content. Such milk was only very slowly acted upon by rennin, but its coagulability was raised by adding calcium chlorid or by increasing the acidity by means of sodium acetate and acetic acid. The calcium chlorid exerted an action beyond that of influencing the acidity.

Investigation and analysis of the production, transportation, inspection, and distribution of milk and cream in New England, J. P. Bowditch et al. (*Boston: Boston Chamber Com., 1915, pp. 63, pl. 1, fig. 1*).—An account of a study made of methods of production, transportation, inspection, grading, and distribution of dairy products in New England. The lack of knowledge of costs among farmers, the lack of systematic methods of distribution among dealers, and the lack of a standardized product were considered to be the principal difficulties at the present time.

The cost of the production of certified milk, W. E. Miller (*Proc. Amer. Assoc. Med. Milk Com., 7* (*1913*), *pp. 260–263*).—It is estimated by the author that for the particular firm investigated 8.42 per cent of the cost of certified milk was due to the cost of certification. The remaining items of cost are given as follows: Wages 28.26 per cent, supplies 2.4, stable—hauling 0.31, power and refrigeration 0.58, repairs 1.31, freight 5.46, feed 47.23, miscellaneous 4.79, and bedding 1.24 per cent.

[The cost of] pasteurized cream (*U. S. Dept. Agr., Weekly News Letter, 3* (*1915*), *No. 13, p. 7*).—In tests made in several creameries, the interest on investment in equipment, including depreciation, repairs, and labor, was estimated at 31 cts. per 100 gal. of cream; coal, at $5 per ton, 4 cts.; water, at 50 cts. per 1,000 cu. ft., and ice, at $1 per ton, 10 cts.; making a total of 45 cts., or 0.15 ct. per pound of butter. In a creamery equipped with a 300-gal. vat ripener, in which pasteurization was also done, the total cost of pasteurizing a vat of cream was about 54 cts., or approximately 0.06 ct. per pound of butter.

An important factor in the total cost is the proper designing and arrangement of the heating apparatus. With poorly arranged apparatus and leaky piping, the loss in heat may reach 30 per cent of that required to pasteurize.

On the other hand, the use of exhaust steam may lessen the work of the boiler to the extent of 1 horsepower to each 400 lbs. of cream pasteurized per hour.

The flash process, in which the cream is raised to a high temperature for a short time only, was found to require about 17 per cent more heat than that needed for the holder process, in which the temperature is maintained for a longer time at a somewhat lower point. In consequence, the flash process calls for a corresponding increase in the quantity of water used in cooling, and the total cost is somewhat greater than in the holder process.

Standardization and branding of dairy produce, T. MACKLIN (*Hoard's Dairyman, 50 (1915), No. 16, pp. 481, 490, 491*).—A discussion of New Zealand methods of dairying, the progress that country has made in methods of standardization and branding of dairy products, and the resulting remarkable export trade in butter. It is suggested that the United States adopt similar methods.

VETERINARY MEDICINE.

Gossypol, the toxic substance in cotton-seed meal, W. A. WITHERS and F. E. CARRUTH (*U. S. Dept. Agr., Jour. Agr. Research, 5 (1915), No. 7, pp. 261–288, pls. 2*).—This is the third paper in a series of studies of cotton-seed meal toxicity reported from the North Carolina Station, of which the first two have previously been noted (E. S. R., 29, p. 477).

The results of the investigations here reported in detail have been summarized by the authors as follows: "Gossypol, first isolated by Marchlewski from cotton-seed oil and considered by him a prospective dyestuff, was extracted by us from cotton-seed kernels and found to possess toxic properties. Cotton-seed kernels were used as the initial material instead of cotton-seed meal because they yield gossypol more readily to solvents and are toxic to about the same extent. Ethyl ether was used as the solvent, the kernels having been extracted with gasoline to remove most of the oil. Evaporation of the ether leaves a crude product which we have designated 'gossypol extract.' A purer product, 'precipitated gossypol,' was obtained from the ethereal solution by the addition of gasoline, and a crystalline product, 'gossypol acetate,' by precipitation by acetic acid.

"Gossypol was fatal to rabbits when administered intraperitoneally in the form of gossypol extract or crystalline gossypol acetate, either when fed in one large dose in the form of gossypol extract or when fed in small daily doses in the form of gossypol extract, precipitated gossypol, or gossypol 'acetate.'"

"The smallest amount of gossypol administered intraperitoneally by us and found fatal to rabbits was 0.24 gm. of crystalline gossypol acetate per kilogram of live weight."

"Gossypol forms an oxidation product which is nontoxic. Cotton-seed kernels are rendered less toxic by the partial extraction of gossypol and nontoxic by a more nearly complete extraction of it. Methods for rendering cotton-seed kernels nontoxic depend upon extracting the gossypol or changing it to physiologically inert forms by oxidation or by precipitation."

A list of 23 references to the literature cited is appended.

The influence of oil of Chenopodium on intestinal contractility, W. SALANT and C. W. MITCHELL (*Amer. Jour. Physiol., 39 (1915), No. 1, pp. 37–53, figs. 9*).—The authors' investigations have been summarized as follows:

"Oil of Chenopodium in dilutions of 1:5,000 and 1:10,000 in Locke's solutions produces in the isolated intestine of rabbits a marked decrease of tone which remains permanent and diminishes frequency as well as force of contractions which disappeared altogether in 20 to 25 minutes. Recovery occurred when the intestinal segments were placed in Locke's solution without oil of Chenopodium.

"In carnivorous animals, oil of Chenopodium usually, but not always, causes a preliminary rise of tone followed by a steady decline. Rhythmic contractions may increase in frequency but disappear finally. Recovery may take place when the segments are put into Locke's solution.

"The reaction to oil of Chenopodium was greater in the ileum than in the duodenum or jejunum, but was most marked in the colon. Caffein has no antagonistic effect but may, on the contrary, aid depression of tone caused by oil of Chenopodium. Neither barium chlorid nor pilocarpin has a true antagonistic effect but may prevent to a small extent depression of tone when added before oil of Chenopodium. Pilocarpin has no action on intestine which has been poisoned by oil of Chenopodium, but barium produces an increase of tone. Nerve ends as well as muscle fiber are attacked by oil of Chenopodium, but the latter is more resistant. Relatively large doses of oil of Chenopodium are required to inhibit peristalsis in intact rabbits by intravenous injection. The presence of substances antagonistic to oil of Chenopodium is offered as an explanation."

Notes on the factors involved in the germicidal effect of freezing and low temperatures, C. M. HILLIARD, CHRISTINA TOROSSIAN, and RUTH P. STONE (*Science, n. ser., 42 (1915), No. 1091, pp. 770, 771*).—Ninety-nine per cent and over of *Bacillus coli* succumbed to freezing in tap water in three hours, while with *B. subtilis* the reduction was not at all uniform, but seldom exceeded 80 per cent. Three strains of *B. coli* tested showed no appreciable variability in relation to the disinfecting influence of cold and freezing. Intermittent freezing had but slightly greater germicidal value than sustained freezing for the same period of time.

Tubes containing the bacteria were frozen and held for three hours for comparison at approximately —15° C. and —2°. The colder temperature was considerably more fatal. Tubes kept at +0.5° used as controls in most of the experiments showed marked variation, but seldom showed over 30 per cent to 40 per cent of the bacteria to be killed.

Cream containing 30 per cent of milk fat afforded a very striking protection to the bacteria when frozen, whether the freezing was continuous or intermittent.

The results led the authors to infer that the degree of cold, time of freezing, crystallization and external pressure, and the composition of the media in which the freezing occurs all have an influence upon the germicidal potency exhibited by cold.

The macrophages of mammals, H. M. EVANS (*Amer. Jour. Physiol., 37 (1915), No. 2, pp. 243–258*).—A critical discussion of the subject with references to the literature.

The facts presented "justify recognition that the great mass of mononuclear cells which we have described constitute a sharply defined cell group or class. The macrophages may now be defined as those mononuclear cells, wherever they may be, lining vascular channels, resident in the connective tissues or entirely free, whose protoplasm constitutes a physical system characterized above all by its response to finely particulate matter."

Annual report of the chief veterinary officer for the year 1913, S. STOCKMAN (*Bd. Agr. and Fisheries [London], Ann. Rpt. Chief Vet. Off., 1913, pp. 44, figs. 2*).—This annual report (E. S. R., 31, p. 177) first discusses the outbreaks of foot-and-mouth disease which occurred in 1913 (pp. 4–7), then hog cholera, swine erysipelas, glanders, anthrax, sheep scab, parasitic mange, tuberculosis, abortion, etc., and gives an account of scrapie (pp. 33–44), including a history of the disease, animals affected, symptoms, nature of the disease, treatment and prevention, and general suggestions.

Common diseases of farm animals, R. A. CRAIG (*Philadelphia and London: J. B. Lippincott Co., 1915, pp. XII+334, pl. 1, figs. 123*).—The several parts of this general work deal with the subject under the headings of nonspecific or general diseases, the teeth, surgical diseases, parasitic diseases, and infectious diseases.

The veterinarian, C. J. KORINEK (*Cedar Rapids, Iowa: The Veterinarian Publishing Co., 1915, pp. 256, figs. 30*).—A popular work in which the causes, symptoms, and treatment of diseases of the horse, cattle, swine, sheep, goat, and poultry are described.

Inquiry into braxy, with a note on "grass sickness" and "head grit" in lambs, and "bracken sickness" in cattle, J. P. M'GOWAN (*Trans. Highland and Agr. Soc. Scot., 5. ser., 27 (1915), pp. 54–141, figs. 14*).—A critical review of the literature and a report of investigations conducted at Edinburgh.

The author has obtained *Bacillus bipolaris septicus ovium* from all cases studied and considers braxy to be a form of hemorrhagic septicemia. "For the present, until the advantages of vaccination by means of a vaccine prepared from *B. bipolaris septicus ovium* have been more fully established, it would appear to be unwise to recommend measures directed against this, the primary cause. Such measures would have the further disadvantage of being expensive to apply."

Foot-and-mouth disease in the United States, V. A. MOORE (*Cornell Vet., 4 (1915), No. 4, pp. 157–163*).—A discussion of the outbreaks of the disease in this country, together with remarks regarding the prevention of its recurrence.

A case of foot-and-mouth disease in man, P. W. CLOUGH (*Bul. Johns Hopkins Hosp., 26 (1915), No. 296, pp. 351–354, pls. 3*).—A detailed, illustrated description of a moderately severe typical case of foot-and-mouth disease which occurred at Baltimore, Md., in a medical student 20 years of age. The infection is thought to have taken place through dairy products, since the disease was present at the time in cattle in the neighborhood.

The use of quinin in the treatment of experimental gaseous gangrene, with notes on the value of quinin hydrochlorid as a general antiseptic, K. TAYLOR (*Lancet [London], No. 10 (1915), II, pp. 538–540; Sci. Amer. Sup., 80 (1915), No. 2076, pp. 242, 243*).—"The results of the observations may be briefly summarized as follows: Quinin has shown a marked bactericidal activity against the gas bacillus. It has inhibited its growth in vitro, where it was ten times as effective as carbolic acid. It has reduced the mortality from gaseous gangrene in animals from 100 per cent to 41 per cent. Quinin has shown strong laboratory evidence of value as a general antiseptic. Its general bactericidal power was higher than that of carbolic acid. It was especially effective in a menstruum of pus. It did not damage healthy tissue in local injections of effective concentrations. It is known to produce local anesthesia, frequently a desirable result. It produced no symptoms of intoxication in the animals treated. It was used in hypertonic solution. It showed a strong antitryptic action in vitro."

Piroplasmosis of the parvum type in cattle on the southern border of the Mediterranean.—Mediterranean coast fever, M. CARPANO (*Clin. Vet. [Milan], Rass. Pol. Sanit. e Ig., 38 (1915), Nos. 12, pp. 497–529, figs. 13; 13–14, pp. 553–596, pls. 2, figs. 5; abs. in Trop. Vet. Bul., 3 (1915), No. 3, pp. 81, 82*).—The author has studied this disease in imported Servian cattle of which 100 per cent became infected and 90 per cent died.

Clinically, an acute or fulminant form, a subacute form, and a chronic form may be recognized. The symptoms are those of a chronic piroplasmosis. According to the author there is evidence that the disease is not caused by a single organism, but by two distinct species which are associated with each

other. One of these is said to be identical with *Theileria parva* and the other with *Piroplasma annulatum*. In severe cases more than 90 per cent of the corpuscles may be invaded. It appears to be practically certain that under natural conditions the disease is spread by *Hyalomma ægyptium*.

Some notes and experiments on Sarcocystis tenella, J. W. Scott (*Jour. Parasitology, 2 (1915), No. 1, pp. 20–24*).—The author considers the studies here reported to be chiefly important for their negative significance.

"Infection with *S. tenella* failed to occur (a) as the result of feeding infected muscle, (b) as the result of eating grass contaminated with feces from a carnivorous animal previously fed on infected muscle, and (c) by allowing infected muscle to decay either on dry grass or in a pond. The apparently positive results of the third experiment are best explained as due to conditions independent of that experiment. All of the evidence favors the view that the sheep is not the definitive host of *S. tenella*, and therefore is in accord with Darling's suggestion [E. S. R., 33, p. 863] that the muscle parasites of vertebrates are aberrant forms."

A bibliography of nine titles is appended.

Various sporotricha differentiated by the fermentation of carbohydrates.—Studies on American sporotrichosis, I, K. F. Meyer and J. A. Aird (*Jour. Infect. Diseases, 16 (1915), No. 3, pp. 399–409*).—The authors' investigations have led to the following conclusions:

"The differentiation of pathogenic sporotricha into two distinct species by means of the fermentation of carbohydrates is impossible. The reactions are not fixed and are as inconstant as the many variations noted in the formation of chlamydospores and, frequently, in pleomorphism. There does exist, however, an apparent relation between the pigmentation of the sporotrichum strains and the ability of these strains to ferment saccharose. The α and β types are the most active fermenters.

"This and other evidence, which will be presented elsewhere, make it apparent that the American sporotricha, of which we studied 35 strains, have in many respects type characters in common with *Sporothrix beurmanni*. In the light of De Beurmann's and Gougerot's work some of the American strains are doubtless *S. beurmanni*, and it is not permissible to call such strains '*S. schenckii*' merely for the sake of simplicity. The discussion of De Beurmann and Gougerot on this subject can now also, in our opinion, be satisfactorily closed, namely, that *S. schenckii*, Hektoen-Gougerot strain, is an absolutely fixed type. The true *S. schenckii* is represented, however, by all of the recently isolated strains. Inasmuch as most of these strains are undoubtedly identical with *S. beurmanni*, the *S. schenckii* is identical with the *S. beurmanni*.

"The American strains of pathogenic sporotricha are therefore best classified as one species: *S. schenckii-beurmanni* (as suggested by Greco)."

Epizootic lymphangitis and sporotrichosis.—Studies on American sporotrichosis, II, K. F. Meyer (*Amer. Jour. Trop. Diseases and Prev. Med., 3 (1915), No. 3, pp. 144–163*).—The studies reported in this second paper on the subject have been summarized by the author as follows:

"Epizootic lymphangitis of equines is caused in South Africa, Algeria, and Jamaica by a parasite which morphologically (Gram positive, irregular inside structure, budding forms) has all the characteristics of a yeast and which biologically behaves, in the complement-fixation test, like a blastomyces. The similarity with Leishmania bodies, which is suggested by some staining reactions (with Giemsa, etc.) and the position of the parasites in the phagocytes, is explained, and it is demonstrated that the serologic tests and the more careful morphological studies with hematoxylin stains do not justify the creation

of a new species of lymphosporidium (Gasperini, 1908).[a] The parasite is not a protozoan but a blastomyces, namely, *Cryptococcus farciminosus.*

"In the United States the disease which was diagnosed as epizootic lymphangitis in 1907 has been recognized as being sporotrichosis. Epizootic lymphangitis apparently does not exist here. Morphologically, by cultures and serum tests, the two diseases can easily be separated. In horses the parasite of sporotrichosis is very rare in the pus and can rarely be demonstrated microscopically.

"The sera from sporotrichotic infections give complement fixation with the *C. farciminosus*, indicating a relation of the *Sporothrix schenckii-beurmanni* to the cryptococcus. This observation is further proof of the vegetable nature of the parasite of epizootic lymphangitis.

"Human infections from equine sources of epizootic lymphangitis and sporotrichosis are rare. It is in the interests of comparative tropical medicine that suspected cases of infections of epizootic lymphangitis should, in future, be carefully investigated bacteriologically and serologically."

A bibliography of 38 titles is appended.

The relation of animal to human sporotrichosis.—Studies on American sporotrichosis, III, K. F. Meyer (*Jour. Amer. Med. Assoc., 65 (1915), No. 7, pp. 579–585, fig. 1*).—The conclusions drawn in this third paper are as follows:

"Spontaneous sporotrichosis of domesticated animals, particularly horses, is very common in certain parts of the United States. Extensive bacteriologic, serologic experiments have proved the identity of the causative organisms in human and animal sporotrichosis. The pathogenicity for human beings was observed in an accidental laboratory infection. The geographic distribution of equine sporotrichosis, which is apparently closely connected with certain telluric and climatic conditions, covers, in two States, the same territories from which numerous cases of human infection have been reported in the last five years. In Pennsylvania equine sporotrichosis as so-called 'epizootic lymphangitis' has been noted in as many as 150 cases annually. Only 2 human cases are on record in that State. A careful study of one case suggested at first a contact infection with a sporotrichotic horse, but this assumption could not be proved conclusively. . . .

"The absence of sporotrichosis among veterinarians and farmers in Pennsylvania, where equine sporotrichosis is so exceedingly common and so often treated calling forth undoubtedly close contact with infectious material, demonstrates that sporotrichotic infections in man are established by this channel of contact in rare instances only."

Conglutination in the diagnosis of dourine (trypanosomiasis of the horse), H. Wehrbein (*Jour. Infect. Diseases, 16 (1915), No. 3, pp. 461–465*).—The author finds that the conglutination method can be used for the diagnosis of dourine but that it is more sensitive to faulty technique and hence more difficult to employ than the usual complement-fixation method.

The passage of trypanosomes in the milk, A. Lanfranchi (*Bul. Soc. Path. Exot., 8 (1915), No. 7, pp. 438–442*).—In the author's experiments with the dog, *Trypanosoma brucei, T. rhodesiense,* and *T. gambiense* passed from infected animals in the milk. *T. evansi* failed to do so.

Preliminary report on the intrapalpebral tuberculin test, J. R. Mohler and A. Eichhorn (*Jour. Amer. Vet. Med. Assoc., 48 (1915), No. 1, pp. 121–123*).—A careful study of the ophthalmic test by the Bureau of Animal Industry has shown it to be less accurate than the subcutaneous test. The intradermal test employed on the subcaudal fold at the base of the tail has proved more promising.

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[a] Sperimentale, 62 (1908), No. 3, pp. 346–375.

The intrapalpebral test, which consists of the intradermal injection in the lower eyelid of ordinary subcutaneous tuberculin (concentrated to 50 per cent of its original volume) was applied to a number of animals known to be affected with tuberculosis and others known by previous subcutaneous tests to be free of the disease. In from 12 to 24 hours from the time of injection in the animals affected with tuberculosis the development of an edema in the lower eyelid was observed, which continued to increase in intensity until in about 48 hours it reached its height, but persisted for 72 hours or even longer. In some instances it extended almost in a circular form around the entire orbital cavity, while in others it only affected the eye in a semicircular manner, appearing as a puffy swelling which was perceptible from a considerable distance. In severe reaction the conjunctiva became injected, with an increased flow of tears and not infrequently a muco-purulent discharge—phenomena which are similar to those in the ophthalmic reactions.

"For diagnostic purposes, however, the latter phenomena are not essential, as the edema which persists for 48 hours after the injection is a sufficient indication upon which to base a positive diagnosis of tuberculosis. In making the observations anyone may readily observe the reaction from a distance of from 25 to 50 ft. in the tuberculous animals, whereas in the healthy animals there is no reaction whatsoever, both eyes having the same normal appearance.

"In some instances the reaction was also accompanied by a more or less pronounced systemic disturbance, indicated by an elevation of the temperature, which varied from 2 to 4° above the preinjecting temperature. . . . The administration of the tuberculin causes no difficulty and the small quantity of the fluid required can be readily forced into the cutaneous tissues with a proper syringe and needle." The dose of tuberculin to be injected is 0.25 cc., which must be injected in the skin proper and not under the skin.

"From the limited observations made on this test it appears that further experimentation is justified; and, should additional experience prove the test to be sufficiently accurate for diagnostic purposes, it could be employed either in place of the subcutaneous or as a test supplementary to the latter method."

Tuberculosis in pheasants, E. M. Pickens (*Cornell Vet., 4 (1915), No. 4, pp. 183–190, figs. 3*).—The author reviews the literature and reports upon an outbreak of this disease in New York State.

The puerperal diseases of cattle and their relation to meat poisoning, A. Voigt (*Die puerperalen Erkrankungen des Rindes und ihre Beziehungen zu den Fleischvergiftungen. Inaug. Diss., Univ. Leipsic., 1912, pp. 89*).—This discussion of the subject includes a bibliography of 212 titles.

Recent investigations on contagious abortion, T. Kitt (*Monatsh. Prakt. Tierheilk., 26 (1914), No. 3–4, pp. 164–174; abs. in Cornell Vet., 5 (1915), No. 1, pp. 61, 62*).—A general review and discussion of the subject with 26 references to the literature.

Sidelights on contagious abortion, W. L. Williams (*Cornell Vet., 5 (1915), No. 1, pp. 25–47*).—This account, based upon investigations previously noted (E. S. R., 31, p. 779), consists of a general discussion of the disease and the handling of it, together with an account of studies of the agglutination test near parturition.

A review of recent progress in hog cholera investigations, H. P. Hoskins (*Jour. Amer. Vet. Med. Assoc., 48 (1915), No. 2, pp. 160–173*).—A review of recent work with references to the literature.

The vacuum method of drawing antihog-cholera serum, T. P. Haslam, A. E. Hagan, and R. V. Christian (*Jour. Infect. Diseases, 16 (1915), No. 3, pp. 487–492, figs. 5*).—The authors here describe and illustrate a system which has been devised as a result of a series of experiments at the Kansas Experi-

ment Station whereby blood may be rapidly and aseptically drawn from the tail of a hog by means of a vacuum. A specially constructed instrument for vacuum tail bleeding, a satisfactory method for the restraint of the hog during bleeding, and an efficient method of separating the defibrinated blood from the fibrin are also described.

The refinement of hog cholera serum, J. REICHEL (*Rpt. U. S. Live Stock Sanit. Assoc., 18 (1915), pp. 127–138, figs. 3*).—Tests made by the author are said to prove conclusively that the cellular débris of antihog-cholera serum does not contain any protective substances. The results were subsequently confirmed through separating the solids from the liquid portion of hog-cholera "antitoxin"—defibrinated blood—with chemical precipitants and filtration, the liquids alone being found to include the protective substances. "Repeated tests on susceptible test pigs of a mixture of the globulins as one of the end products, the serum albumin as another, and the cellular débris, etc., as another showed that the globulins alone carried with them the protective substance. Subsequent tests showed that the protective substance was associated with the pseudoglobulin alone, and for practical purposes it seems unnecessary to separate the euglobulin from the pseudoglobulin."

Hog cholera control, C. H. STANGE (*Jour. Amer. Vet. Med. Assoc., 48 (1915), No. 2, pp. 156–159*).—A statement of the situation in Iowa.

Bacillary white diarrhea (Bacterium pullorum infection) in young chicks in Massachusetts, G. E. GAGE and BERYL H. PAIGE (*Massachusetts Sta. Bul. 163 (1915), pp. 48, pls. 3, fig. 1*).—This bulletin sets forth the facts concerning bacillary white diarrhea of young chicks, including a discussion of its cause, distribution, diagnosis, and economic importance in Massachusetts. See also a previous note (E. S. R., 31, p. 683). The results obtained from the work of the veterinary department in applying the macroscopic agglutination test as a means of detecting hens which may be the source of infection are reported upon, details relating to the results of the testing of representative flocks from chosen districts being presented in tabular form. A map showing the areas in which infection has been detected by the isolation of cultures of *B. pullorum* and the agglutination test is attached. The infection appears to be distributed throughout the State.

RURAL ENGINEERING.

Evaporation and seepage from irrigation reservoirs, K. A. HERON (*Engin. News, 74 (1915), No. 7, pp. 294, 295, figs. 2*).—Evaporation, seepage, inflow, and outflow records of two somewhat shallow reservoirs with unfavorable bottoms are briefly reported, showing that the seepage losses are greater as the depth of water in the reservoir increases. The water carries very little sediment and the bottoms are sand, silt, and adobe underlaid with a hardpan layer from 2 to 8 ft. thick.

Transmission losses in Modesto irrigation canals, K. A. HERON (*Engin. News, 74 (1915), No. 13, p. 583, fig. 1*).—A summary of observations of transmission losses by seepage and evaporation on 18 unlined earth canals and laterals of the Modesto irrigation district, California, are graphically reported.

According to the curve of average losses for the 18 canals, the losses varied from 2 second-feet per mile of canal for canals carrying 100 second-feet to over 3.5 second-feet per mile of canal for canals carrying 600 second-feet. The unusually high transmission losses are attributed to the warm summer temperature and to the sandy formations and soils of the district. It is thought that the curve will represent average conditions in generally sandy areas.

Enlarging an irrigation canal, K. A. Heron (*Engin. News, 74 (1915), No. 11, pp. 486, 487, figs. 9*).—A concrete-lined irrigation canal was enlarged by raising the lining wall, breaking up one wall with dynamite and moving it back, and lowering the bottom.

Irrigation weir, measuring rod, and discharge card, K. A. Heron (*Engin. News, 74 (1915), No. 6, p. 257, figs. 2*).—At frequent intervals in canals of the Modesto project, California, weirs are placed to afford a vertical drop in grade or to raise the head on a side gate. Movable flashboards are used to obtain the desired head. The structures consist of two or more weirs, each about 3½ ft. in length, constructed on a downstream slope of between 35 to 45° from the vertical. Tests of a method of making measurements, consisting of holding vertically on the weir crest a ¾-in. smooth iron rod to determine the head and using this in the Francis formula as though there were no end contractions or slope to the weir, have shown the method to be sufficiently accurate for practical purposes.

Life of wood pipe, D. C. Henny (*Reclam. Rec. [U. S.], 6 (1915), No. 8, pp. 354–358; Engin. News, 74 (1915), No. 9, pp. 400–403; abs. in Engin. Rec., 72 (1915), No. 6, p. 162*).—The author summarizes his experience and reports studies in tabular form on continuous and sectional wood-stave pipe and sectional bored-wood pipe, drawing the following conclusions in regard to the relative life of fir and redwood in pipe:

"Under favorable conditions of complete saturation fir well coated may have the same life as redwood uncoated. Either kind of pipe will have a longer life if well buried in tight soil than if exposed to the atmosphere. Such life may be very long, 30 years and over, if a high steady pressure is maintained. Either kind of pipe will have a longer life if exposed to the atmosphere than if buried in open soil, such as sand and gravel and volcanic ash, provided in a hot and dry climate it be shaded from the sun. Under questionable conditions, such as light pressure or partially filled pipe, fir, even if well coated, may have only from one-third to one-half the life of redwood. Under light pressure the use of bastard staves in fir pipe should be avoided.

"The use of wooden sleeves in connection with wire-wound pipe is objectionable and has caused endless trouble and expense. It is possible that the objection may be partially overcome by dipping the ends of sleeves in creosote and by applying a heavy coating of tar to the ends of the sleeves. Saturation of sleeve wood will never be as perfect, however, as of the straight pipe, and full creosote treatment of the wood or else some form of metal sleeve, either riveted iron or steel heavily coated, or cast iron, will probably be well worth its extra cost. If wooden sleeves are employed, they should be provided at least for sizes from 10 in. up with individual bands to permit taking up leaks.

"Pitch seams do not occur in redwood. In fir they should be distinctly limited as to size, frequency, and depth. In respect to knots, there appears to be no reason for making any distinction between the two classes of wood. Small, sound knots, if not passing through the full thickness and not occurring close to edges or ends might be permitted in either wood. Sap is objectionable, and the higher cost in prohibiting it entirely or of putting narrow limitations on it is probably justified in both fir and redwood.

"Wooden pipe is not suitable in cases where it can not be kept full and under pressure during periods of use. Coating can not under such condition be expected to afford protection against decay. Coating should be continuous and heavy, not less than $\frac{1}{8}$ in. to be fully effective, and should preferably consist of more than one individual coat of a mixture of asphaltum and tar, or of an application of gas tar followed by one or more applications of refined

coal tar. Little experience, however, can be quoted in support of all-tar coating."

Surface water supply of western Gulf of Mexico basins, 1914 (*U. S. Geol. Survey, Water-Supply Paper 388 (1915), pp. XXXIII+124, pls. 2*).—This report, prepared in cooperation with the State of New Mexico, presents the results of measurements of flow made on streams in the Rio Grande River and interior of New Mexico drainage basins.

Water supplies in the Philippine Islands, II, G. W. Heise (*Philippine Jour. Sci., Sect. A, 10 (1915), No. 2, pp. 135–169*).—This is the second report on providing the people of the Philippines with pure drinkng water (E. S. R., 33, p. 587).

It is stated that during 1914 the Bureau of Public Works drilled 120 deep wells, of which 103 were successful, while Provinces and private individuals drilled perhaps an equal number. The total number of deep wells in the Islands is over 1,000.

During the year about 200 chemical analyses and 2,100 biological examinations were made, but, owing to the fact that many of the samples were not properly taken and were not accompanied by sufficient data concerning their sources, their sanitary analysis in a number of cases is considered of doubtful value. Field investigations of the water supplies of Mindoro, Cebu, and Panay are reported, with analytical data in tabular form. In many borings, especially near the coast, brackish water is encountered during the first 30 to 70 meters, even though fresh water may be found at low levels. The minimum temperature of deep wells drilled in the lowlands is about 28° C. (82.4° F.), but the temperature range is great. The deep well waters ranged in total solids content from about 120 to 8,200 parts per million, and in chlorin content from 1.5 to 4,471 parts per million. The highest free ammonia content recorded was 32.7 parts per million. "In general, the deep wells show a high degree of bacteriological purity. The flowing wells, so far as known, are all sterile or very nearly so, and deep-pumping wells seldom show any marked degree of bacterial pollution except where the equipment is defective or carelessly handled."

Of 16 surface wells examined 15 gave unmistakable evidence of pollution on a single examination, while the sixteenth was so located that contamination at some time seemed a foregone conclusion. "It would probably be conservative to say that the water from over 80 per cent of the wells is unfit to drink, and that very few of the wells are safe throughout the year. . . . The surface wells, with the exception of a few located so near the ocean that they were obviously contaminated by sea water, range in total solids content from 164 to 1,230 parts per million, and in chlorin content from 5.5 to 436 (average about 150), while the highest free ammonia content noted is 0.64."

The spring waters examined varied widely in quality, the total solids content ranging from 24 to 6,025 parts per million and chlorin from 0.7 to 3,120 parts per million, while the maximum free ammonia content was 6.2 parts per million.

The importance of the Bacterium coli in the judgment of water, E. Quantz (*Ztschr. Hyg. u. Infektionskrank., 78 (1914), No. 2, pp. 193–227; abs. in Chem. Zentbl., 1915, I, No. 11, p. 570; Centbl. Bakt.* [*etc.*], *2. Abt., 43 (1915), No. 17–18, pp. 465, 466*).—Tests of a large number of water supplies, mainly from wells, are reported, the purpose of which was to determine the significance of *B. coli* bacteria in judging the purity of water supplies.

It was found that normal ground water does not contain *B. coli* bacteria, and their presence in ground water is taken to indicate pollution from surface sources. Owing to the fact that *B. coli* bacteria do not readily multiply nor live long in water, the test is considered to be more valuable than the total

bacterial count. The absence of *B. coli* bacteria in well water after repeated tests, however, does not necessarily indicate the absence of contamination.

It was also found that *B. coli* bacteria are apt to occur rather widely in surface soil, their numbers decreasing rapidly with depth. It is thought, therefore, that surface wash bringing *B. coli* bacteria into well water does not always contaminate it, but the more numerous these bacteria in well waters and the more typical their acid-forming activities the greater is believed to be the danger of disease contamination. It is considered advisable that the final decision in this matter be governed by the location and surroundings of the well.

It is further concluded that the number and character of *B. coli* bacteria present in well water may serve to indicate the efficiency of filtration.

Further experiments on the usefulness of the Berkefeld filter for the purification of water supplies containing lead, P. SCHMIDT (*Arch. Hyg., 82 (1914), No. 8, pp. 351–354; abs. in Chem. Zentbl., 1915, I, No. 11, p. 563*).—In experiments extending over four months to determine how long a Berkefeld household filter will continue to remove the lead from water contaminated with lead, it was found that the lead in the filtrate gradually increased, reaching a maximum after 22 days and a filtration of 3,000 liters of water. Thereafter there was a gradual decrease of lead in the filtrate until it was reduced to one-tenth. These results are taken to indicate that the iron in the water formed a filtering layer of colloidal iron on the filter surfaces. The author concludes, therefore, that the Berkefeld house filter is a useful aid in the purification of such waters, especially if they contain traces of iron. Further experiments showed that the lead was fixed on the surface of the filter in hydroxid form.

Automatic device controls hypochlorite application, E. E. LUDWICK (*Engin. Rec., 72 (1915), No. 4, pp. 103, 104, figs. 6*).—An apparatus for automatically gaging the amount of chemical to a varying flow of sewage in an institutional sewage-disposal plant is described. The works comprise an Imhoff tank, intermittent siphon, sprinkling filter, chemical house, and a final settling tank. The rise and fall of the sewage in the siphon chamber actuates the mechanism.

Water purification plants and their operation, M. F. STEIN (*New York: John Wiley & Sons, 1915, pp. VIII+258, pls. 3, figs. 103; rev. in Engin. Rec., 72 (1915), No. 9, p. 268*).—The purpose of this book is to give instructions for the operation of water-purification plants. It has in general been the endeavor to treat the subject with special regard to the requirements of the nontechnical operator of small plants, for whose benefit it has been attempted to include all information and data required, such as instructions for preparing standard solutions, making bacterial and chemical tests of the water, handling coagulants, washing filters, keeping records, etc. As a further aid, charts embracing the computations necessary in determining the amounts of coagulants to be used have been added. A chapter giving detailed descriptions of the various types of plants and their component parts, together with numerous examples, and a chapter on the natural chemistry of water are also included.

Highway laws of the United States (*Good Roads, n. ser., 10 (1915), No 6, pp. 83–97*).—This is a digest of the laws governing the administration, construction, and maintenance of highways in the several States.

Papers presented at the Pan-American Road Congress (*Good Roads, n. ser., 10 (1915), No. 14, pp. 189–215*).—These papers include the following: The History and Future of Highway Improvement, by L. W. Page; The Essentials of Proper Laws for Highway Work, by E. A. Stevens; The Essentials of Proper Laws for Highway Work, by A. N. Johnson; Highway Indebtedness, Its Limitation and Regulation, by N. P. Lewis; The Determination of the

Justifiable Outlay for Specific Cases of Highway Improvement, by C. Richardson; Organization and System in Highway Work, by A. B. Fletcher; System in Highway Accounting, by S. D. Gilbert; Proper Road Location, Its Importance and Effects, by W. R. Roy; Road Drainage and Foundations, by G. W. Cooley; Roadway Surfacings, by F. F. Rogers; Street Pavements, by C. Hill; Maintenance—Materials and Methods, by A. W. Dean; Convict Labor for Highway Work, by G. P. Coleman; Resurfacing Old Roads, by W. D. Uhler; and The Benefits and Burdens of Better Roads, by S. E. Bradt.

The farmer's poultry house, H. L. Kempster (*Missouri Sta. Circ. 75* (*1915*), *pp. 18, figs. 19*).—This circular describes and illustrates the types of poultry houses used by the department of poultry husbandry of the University of Missouri.

With reference to house construction it is stated that 4 sq. ft. of floor space and 8 to 15 in. of roosting space should be allowed to each hen and one nest to every four or five hens. "Where muslin is used for ventilation purposes, 1 sq. ft. of muslin should be placed on the south side for every 15 sq. ft. of floor space, if the house is 15 ft. wide. If the house is 10 ft. wide, on the south side use 1 sq. ft. of muslin to every 20 sq. ft. of floor space, and if the house is 20 ft. wide, on the south side use 1 sq. ft. of muslin to every 10 sq. ft. of floor space. [These] rules will also apply in the use of the shutter front method of ventilation. The height of the tops of the windows, if placed on the south side, should be a little less than one-half as high as the house is wide. Glass should be placed in the house at the rate of 1 sq. ft. to every 15 sq. ft. of floor space. If the chickens are yarded, 150 sq. ft. of yard space should be allowed for each bird. The square house is the most economical to construct."

RURAL ECONOMICS.

Agricultural development of the Pacific Coast, E. J. Wickson (In *Nature and Science on the Pacific Coast. San Francisco: Paul Elder & Co., 1915, pp. 214–227*).—The author gives the historical development of the agriculture and describes the climate, soil, irrigation system, tillage, and present extent of agriculture in the Pacific Coast States.

The crisis of the small farmer in Italy, B. Rambaud (*Ann. École Nat. Agr. Grignon, 4* (*1913*), *pp. 46–111*).—The author discusses the extent of small farming, crops grown, live stock kept, rotations followed, and the general systems of agriculture in the different Provinces, and considers methods of improving the farm operators' condition and making their agriculture more profitable.

Economic and social evolution of the small agricultural proprietors, C. Tommasina (*Ann. R. Accad. Agr. Torino, 57* (*1914*), *pp. 193–203*).—The author treats of the origin, advantages, and disadvantages of this type of farming, and means for improving the condition of this class. He suggests the formation of an association to sell their products and the establishment of cooperative credit associations and other organizations to enable them to act as a unit.

Agricultural credit banks and cooperative societies (*Proc. Internat. Cong. Trop. Agr., 3* (*1914*), *pp. 198–212*).—These pages contain abstracts and discussions of the following papers: Agricultural Credit Banks and Cooperative Societies, by J. Douie; Agricultural Credit in the Portuguese Colonies, by H. J. Monteiro de Mendonca, J. D. C. de Sousa e Faro, and E. Jardim de Vilhena; and The Working of Credit Banks in the Dutch East Indies, by H. C. Alting.

Agricultural associations, von Cetto (*Landw. Jahrb. Bayern, 4* (*1914*), *No. 1, pp. 1–28*).—This article gives a historical description of the various Bavarian agricultural associations and their organization into a chamber of agriculture.

[Increasing the usefulness of the district agricultural associations], LUSCHKA (*Landw. Jahrb. Bayern, 4 (1914), No. 1, pp. 29–40*).—This article discusses the legal status of the Bavarian associations and their problems in the light of the demands of present times, also the proper undertakings for the local unions and their relations to a central organization. Methods of cooperating with other agricultural associations are pointed out.

Farmers' elevators in Minnesota, L. D. H. WELD (*Minnesota Station Bul. 152 (1915), pp. 24, fig. 1*).—The annual reports filed with the University of Minnesota indicate that there were on January 1, 1915, at least 278 cooperative farmers' elevators in the State. The elevator companies had a membership of 34,500, or 1 farmer out of every 5 in the State. The aggregate amount of business conducted was $24,000,000, of which $22,000,000 represented the value of grain marketed and the balance the supplies purchased.

Of the 239 companies reporting, 94.5 per cent had the one man one vote principle, five-sixths limited the number of shares that one person could own, while the majority did not limit the dividends that might be declared on capital stock. A very few companies imposed a penalty on members who sold grain or other products to outside parties. The salaries of managers ranged from $60 to $165 a month, the average being about $90.

As to the sources from which the elevator companies borrowed money, 51 per cent were financed in whole or in part by commission men, 72 per cent borrowed more or less from local banks, and only 13 per cent borrowed from the farmers. About one-fourth of all the elevators reported that they were financed exclusively by commission houses. The average rate of interest charged by commission houses was 6.7 per cent, by local banks 7.4 per cent, and by farmers 6.3 per cent.

The elevators had a capacity ranging from 20,000 to 40,000 bu. of grain, with an average of 27,000.

There are also included in this report suggestions as to how to organize a farmers' elevator company under the Minnesota cooperative law, articles of incorporation, and the Minnesota law relating to cooperative associations and rural telephones.

Cooperative owning agreements, C. L. STEWART (*Farmers' Rev., 47 (1915), No. 47, pp. 1028, 1043, figs. 2*).—This article describes methods devised for the cooperative owning of threshing machinery. It points out that the associations that have been formed are primarily for getting threshing machinery into the community and secondly for financial advantage. Methods of organizing the association and conducting the business are outlined.

[Railway freight rates on agricultural products] (In *Comparison of Railway Freight Rates in the United States, the Principal Countries of Europe, South Australia, and South Africa. Washington: Bur. Railway Econ., 1915, pp. 66–81, 96–109*).—In these pages freight rates for grain, fertilizers, and manures in the United States and a number of foreign countries are given. An endeavor has been made to present those rates under which moves the greater part of the traffic for the articles mentioned. The tables indicate the movement of the shipment, minimum weight to which the rate applies, the rate per ton, and the charge per ton-mile.

Parcel post profit from farm produce, H. H. WEST (*Rockford, Ill.: Author, 1915, pp. 32*).—This pamphlet contains suggestions for advertising, obtaining customers and holding their trade, and methods of shipping by parcel post, and other advice as to methods of making sales to consumers direct.

Monthly crop report (*U. S. Dept. Agr., Mo. Crop Rpt., 1 (1915), No. 7, pp. 65–76, figs. 9*).—This number gives the usual monthly estimates of the acreage, condition, and yield of the more important agricultural crops, the farm prices

of important products, and the range of prices at important markets, with miscellaneous data, including charts showing the annual variation in crop yields, and special reports regarding the acreage, yield, and average production and the hop production and average consumption.

A special inquiry was made in the States mostly affected by the lateness of the corn crop and the earliness of the first freeze to ascertain the various degrees toward maturity of the crop this year and in a usual year for comparison. The following table shows the situation in the States most seriously affected:

Degree of maturity of corn crop at time of first killing frost.

	Percentage of total corn acreage.				
	Wisconsin.	Minnesota.	Iowa.	North Dakota.	South Dakota.
Fully matured, year 1915	10	10	25	8	26
Usual year	83	86	88	60	84
Portion of crop fit to husk, year 1915	24	28	32	15	58
Usual year	88	77	83	60	98
Proportion of crop fit for seed, year 1915	4	5	14	2	15
Usual year	36	58	51	35	59
What reduction from a normal has been caused by killing frost:					
To yield, year 1915	52	48	37	60	38
Usual year	11	8	6	20	9
To quality, year 1915	64	64	55	60	59
Usual year	11	8	3	20	13

There are also given estimates for the monthly percentages of the year's receipts by farmers from sales of all kinds of produce, from the sales of crops by States and geographic divisions, and from sales of live stock and live-stock products by geographic divisions.

In a special article on The World's Wheat in 1915, C. M. Daugherty estimates that the wheat crop in non-European countries for 1913 was 1,776,521,000 bu.; for 1914, 1,694,806,000; and for 1915, 2,064,876,000; and in European countries, for 1913, 1,783,479,000; for 1914, 1,548,372,000; and for 1915, 1,728,249,000.

Statistical annual, 1915, E. G. Osman (*Price Current Grain Rptr. Statis. Ann. 1915, pp. 80*).—In this annual are given the production in the United States and movement at important centers of agricultural crops, live stock, and packing-house products, together with data regarding prices.

AGRICULTURAL EDUCATION.

The value of education to the farmer, O. R. Johnson (*Missouri Sta. Circ. 77 (1915), pp. 4*).—In this circular a comparison is made, on the basis of data secured in the 1912 farm-management survey conducted by the Missouri College of Agriculture in the western part of Johnson County, Mo., between two groups of farmers, viz, 554 who have received only a rural-school education and 102 who have received more than a rural-school education, amounting on the average to practically two years in the high schools of to-day.

These data indicate that the better educated farmer is making an income 71.4 per cent greater than the man with less education, and even after the labor income of the latter is adjusted to allow for his smaller size of business, the former still has about 40 per cent the greater income. "The facts that he gets slightly better yields and has a system which furnishes him more productive labor, and that he keeps more live stock, seem to show that he has somewhat greater ability in the organization and handling of his business."

Utilization of land by high schools teaching agriculture.—I, The school farm; II, Home projects, W. G. HUMMEL (*Univ. Cal. Chron., 16 (1914), No. 4, pp. 431–442; 17 (1915), No. 3, pp. 309–319*).—This is a discussion of the function of land in connection with public-school agricultural instruction, referring briefly to present approved ideas as to agriculture in the public schools, the size, equipment, care, and management of the school farm, and home projects.

The author concludes that every high school offering agricultural courses should own a limited amount of land, 2 or 4 acres in the present consensus of opinion, to provide laboratory material for class use and to serve as an out-door agricultural laboratory. The school training should be supplemented by home-project work, which provides opportunities for a greater variety and amount of practical agricultural work than could be carried on on a small school farm, and for practice in agricultural operations under actual farm conditions; quickens the sense of personal responsibility; emphasizes the importance of results in agricultural operations; and is an aid to the agricultural instructor in becoming acquainted with farming conditions and with the boys and adult farmers. The projects may be production, demonstration, or improvement projects, the production project being deemed truly vocational and more important than the other two. As a secondary function the school farm may also serve as an entering wedge to introduce better farming into each community. "The function of land in connection with the agricultural nature study of the first six grades is to give opportunity for observation and acquaintanceship with agricultural facts, under careful guidance," and in the seventh and eighth grades to give the youth an opportunity for doing practical work in agriculture in simple selected projects.

See also a previous note (E. S. R., 33, p. 797).

First annual report on boys' and girls' club work, 1914, W. R. HART (*Agr. of Mass., 62 (1914), pp. 455–477, pls. 4*).—This is a review of the progress in boys' and girls' agricultural club work in Massachusetts in 1914. The work included home economics, poultry, hay, market garden, canning, corn, and potato clubs.

Report of the ministry of industries [of Uruguay] for 1913 (*Mem. Min. Indus. [Montevideo], 1913, pp. 1035, figs. 69*).—This is a report on the progress made in 1913 by agencies for the promotion of agriculture and other industries in Uruguay.

Annual report of the education branch on the distribution of grants for agricultural education and research in the year 1914–1915 (*Bd. Agr. and Fisheries [London], Ann. Rpt. Ed. Branch, 1914–15, pp. X+154*).—This report contains a summary of the year's progress in agricultural education and research, notes on the various phases of agricultural instruction in each of the 11 agricultural provinces of England and Wales, work at the research institutes, investigations aided by special research grants, work for which grants are paid from the development fund through the board, and publications. Appendixes contain tabulated information concerning grants awarded for agricultural education and research in 1914–15, research scholarships in agricultural science, organization lists, and other statistics.

The celebration of the fiftieth anniversary of the founding of the Agricultural Institute of the University of Halle, June 15 and 16, 1914, F. WOHLTMANN (*Kühn Arch., 6 (1915), pt. 1, pp. 1–32*).—This account includes a historical review, by the director of the institute, of the development of agricultural instruction in Germany up to and including the establishment of this institute, and of animal husbandry work in Germany in connection with the dedication of the new building of the animal-breeding institute.

Course of study in elementary agriculture for the Wisconsin rural schools, F. E. HEALD (*Madison, Wis.: State Supt. Pub. Instr., 1915, pp. 122*).—This publication is the result of a cooperative agreement between the States Relations Service of this Department, the state superintendent of public instruction, and the dean of the Wisconsin College of Agriculture. Topics are outlined for two years' work in agriculture adapted to the seventh and eighth grades in Wisconsin schools. Each year's work includes a study of some farm animals, one main field crop, and related practice, while poultry and garden projects are carried throughout the two years. The topical outlines are arranged in seasonal sequence so far as practicable, and include suggestions for illustrative material, class instruction, practical exercises at the school and home and in the field and community, correlation with other school subjects, and references to the literature.

Schools of agriculture, mechanic arts and homemaking. The course of study, L. S. HAWKINS and G. A. WORKS (*Univ. State N. Y. Bul. 597 (1915), pp. 17*).—This bulletin contains suggested outlines of topics and courses for each of the four years of instruction in agriculture and home making for high schools of agriculture, programs for pupils and for small high schools maintaining courses in these sujects, and a list of recent books on agriculture. Changes in the New York system, effective since the fall of 1915, are also outlined.

[Instruction in agriculture and home economics], EDITH K. O. CLARK (*In Course of Study for the Elementary Schools of Wyoming. Laramie, Wyo.: State Supt. Pub. Instr., 1915, pp. 27–46, 118–126, 138–143*).—Work in home economics and in agriculture for the seventh and eighth grades is outlined.

Manual training in village and rural schools, G. E. BRAY (*Agr. Ed. [Kans. Agr. Col.], 6 (1914), No. 6, pp. 33, figs. 12*).—This bulletin includes suggestions for woodworking for rural schools, and gives directions for making a cutting board, bench hook, insect case, forcing box, hotbed or cold frame, feed hopper, seed germinator, hammer handle, and evener and singletree.

Student's manual in household arts: Food and cookery, MARTHA L. METCALF (*Indianapolis: Industrial Education Co., 1915, pp. VI+303, pl. 1, figs. 76*).—The object of the manual is to give training in manipulation and a good working knowledge of the composition of food and the principles of cookery. Interesting and valuable facts concerning the history, manufacture, and commercial value of each of the principal food products and about 120 tested recipes are included in the 21 lessons, each of which consists of class discussions, laboratory exercises, reading notes, and home work.

Domestic science. State course of study for the public schools of Indiana (*Dept. Pub. Instr. [Ind.], Ed. Pubs., Bul. 20 (1915), pp. 126*).—This bulletin outlines in accordance with the state course of study, (1) the minimum requirements for practical arts work in the graded and high schools of Indiana; (2) the aim and scope, methods of instruction, and requirements of the home economics work; (3) lessons in home economics arranged in seasonal sequence for the seventh and eighth grades and for the high school; and (4) the library and equipment needed.

Home work for school credit.—I, Poultry project, J. C. WERNER (*Kans. Agr. Col. Ext. Circ. 4 [1915], pp. 8, figs. 3*).—This pamphlet, which has been prepared primarily for use in a home project in poultry raising for school credit for pupils in either rural, village, or city schools, gives instructions on suitable buildings, feeding fowls for eggs and fattening, kinds of fowls, raising chicks, care of eggs, and making records of work.

NOTES.

Arizona University and Station.—The annual farmers' short course was held at the college of agriculture from January 3 to 15. A total of 127 students was registered in agriculture and 35 students in home economics. This was an increase of about 20 per cent above the attendance of any previous year. A feature of the course was an irrigation congress which was participated in by farmers, officers of water users' associations, members of the U. S. Reclamation Service from Arizona and New Mexico, and irrigation engineers from California.

A. M. McOmie, assistant agriculturist in the station, resigned January 1 to engage in private work.

Iowa College.—Dr. Irving E. Melhus, pathologist in cotton and truck diseases in the Bureau of Plant Industry of this Department, has been appointed associate professor of plant pathology.

Maine University.—Dr. Merritt C. Fernald, the first member of the faculty of the institution, its acting president from 1868–1871, and its president from 1879–1893, died at Orono January 8, at the age of 78 years. Dr. Fernald also served as emeritus professor of philosophy from 1893–1898, when he retired under a special pension from the Carnegie Foundation for the Advancement of Teaching.

Missouri University.—W. M. Regan, instructor in dairy husbandry, has resigned to take charge of the dairy husbandry work at the Nevada University and Station, beginning January 1. L. W. Wing, jr., a graduate student in Cornell University, has been appointed assistant in dairy husbandry. E. M. Parrish, instructor in soils and farm crops at Tuskegee Institute, has been appointed demonstrator for negro farmers in Missouri for the six months each year beginning March 1, vice C. S. Woodard, who declined the appointment previously noted.

Nebraska University.—Elmer Lamont Rhodes has been appointed instructor in farm management, beginning February 1. R. E. Holland has resigned as assistant in instructional agronomy to become county agent of Kimball County.

Nevada University and Station.—Charles E. Fleming, grazing examiner of the Forest Service of this Department, has been appointed professor of range management, beginning in February. It is planned to undertake experimental work in methods of range improvement and management, largely along botanical and economic lines.

Texas Station.—J. J. Taubenhaus, Ph. D., associate plant pathologist at the Delaware Station, has accepted an appointment as plant pathologist and physiologist, beginning February 1.

Wisconsin University and Station.—H. W. Stewart has been appointed assistant professor of soils, and Dr. J. H. Coffman instructor in veterinary science in the college of agriculture and assistant in veterinary science in the station.

Section of Agriculture, American Association.—The two features of the meeting of the Section of Agriculture of the American Association for the Advancement of Science, at Columbus, Ohio, during the holidays, were the address of the retiring vice-president, Dr. L. H. Bailey, and a symposium on The Relation of Science to Meat Production.

Dr. Bailey's address was in a sense a continuation of his vice-presidential address of last year (E. S. R., 32, p. 102), the subject being The Forthcoming Situation in Agricultural Work, II. In this he dealt first with questions of organization, administration, and relationships of agricultural work—the tendency, as he saw it, to overorganize and the danger of centralized administrative control. He expressed the feeling that "we are in immediate danger of developing in our institutions a set of administrative officers controlling affairs, who are separate in spirit from the real work of research and education."

To maintain the proper external influences and to carry forward the work through other agencies than the state agricultural colleges, the speaker advised the extension of rural teaching founded on agriculture into general and liberal arts institutions "to the end that they may be made a means of culture, a force for training in citizenship, and a broadening influence in the institutions;" and he pointed to the opportunity for a new kind of agricultural institution of very high grade, founded on private endowment. Of the latter he said: "This will be a coordinating and leadership institution, teaching advanced and special students in some subjects, engaging in research, but in the main making its contribution as a place for conference, for consideration of the large civic and social relations of rural life, and as a voluntary meeting place on common and neutral ground for all the forces that lie in the situation." Such an institution would afford "better opportunities than the land-grant or other state-named institutions are likely to give the freest men." It would "conserve the independence and the opportunities of the boldest prophets."

The symposium on The Relation of Science to Meat Production comprised an introduction by President W. O. Thompson, of Ohio State University, and four papers setting forth different aspects of the question.

Dr. Thompson defined the Nature of the Problem, the background of which lies in the fact that the people of this country have been a meat eating people for many generations, and any limit to the supply or any execessive cost will meet with serious objection. The problem of meat production is largely an economic one in farm management. It has been affected by the change which the whole country has been undergoing—the change in farming conditions, the extension of agriculture to new regions, the breaking up of the public domain, and the restriction by barbed wire. The rapid development of cities in the East and Central West has made a demand for dairy products which has tended to increase the dairy industry, even in the vicinity of small towns, and this in turn has affected the keeping of beef cattle. The large risk sustained in live stock keeping has contributed another angle, as has also the problem of advantageous marketing. The size of farms has been reduced, with less land given up to pasturage in the Central West, and the tenant system has increased. This system does not favor beef production.

Dr. Thompson maintained that the problem is not a haphazard one, but involves definite factors and must be studied from a broad standpoint, including the relations to systems of farming and the maintenance of fertility, the maintenance of the health of live stock to reduce the risk, and advantageous marketing conditions, in the firm belief that the laborer shall receive his reward.

President H. J. Waters, of the Kansas Agricultural College, outlined the following points to be borne in mind in considering the question of meat supply: (1) There is a constant reduction in the per capita consumption of meat as the result of a widespread campaign against meat eating. If the consumption should be reduced in the next half century to the average for the world we could provide for twice the present population. (2) Meat production must yield a

larger net profit than grain and hay farming to induce farmers to follow it. It involves more work, more risk, and keeps farmers employed the year around. (3) The meat production of the world has been at a standstill for the past five years. No large increase can be looked for in Argentina or Australia, as the economic and practical limits have about been reached. Any increase must come from home production, on the farm mainly and not on the ranges. This means that the problem of meat production must be solved on relatively high priced lands.

President Waters enumerated some of the ways in which science may help live stock farming. It may do this by equalizing the feed supply from year to year, by showing the farmer how a surplus of feed may be carried over, as in the silo for example, to tide over lean years. Years of drought force the selling of stock on a glutted market, which necessitates the farmer starting anew. Fluctuating values, high and low, restrict production alike, for they restrict the carrying of young stock; high prices stimulate close selling and the slaughter of young stock.

The improper balancing of feeds was cited as perhaps the greatest source of loss in feeding. Science has made us cautious about compounding mathematical rations, as was formerly done, and has taught something of the value of proteins from different sources, and of the relations of mineral constituents of feeds to efficient nutrition, growth, and reproduction. Again, breeding offers further opportunity for improvement, and science may also help the farmer to meet the changes in the demand of the market. For example, the use of vegetable oils has reduced the price of lard and increased the demand for bacon and ham hogs. This may help to conserve the meat supply.

Science may also help by disclosing the factors of growth. Already there is a basis for a better understanding of this as a result of recent investigation. Such investigation upon the stunting effect of food deficiency, for example, has shown the practicability of letting animals grow when the farmer has feed and letting them rest when feed is scarce; the retardation of growth is not so serious as was formerly thought. These and other studies of growth factors it was believed may have a practical bearing on meat production.

Prof. H. W. Mumford, of the University of Illinois, discussed The Problem of Meat Production on the High-Priced Lands of the Middle West. He contended that the seven corn-surplus States—Ohio, Indiana, Illinois, Iowa, Missouri, Kansas, and Nebraska—constitute the natural center of beef production in this country. Corn-fed cattle are the distinctive feature of the cattle industry of the country, and cattle raising in the corn belt provides a market for the crops grown on the farm and at the same time conserves the fertility of the soil.

As a result of changed conditions a large percentage of the feeders do not grow their live stock but now purchase their stockers and feeders from the great breeding ground of the Southwest. As a result of this change, the business of cattle feeding has gravitated into the hands of large feeders, the capital, risk, and business skill involved, and the distance from markets, deterring many farmers from attempting to convert their corn into beef. But in order that beef production in the corn belt may take its proper place, it was deemed desirable that the business should be distributed more generally among farms of average size. The belief was expressed that "an increasing proportion, and eventually a large proportion, of the cattle matured in the corn belt must be reared there," and it was thought that certain lands there might be advantageously used for the purpose.

A remunerative and reasonably stable market were declared indispensable to the further development of the industry. An increased meat supply will come only as a result of higher prices. For a generation or more meat products have been sold at a price which does not cover the cost of production under present-day conditions. It was prophesied that any considerable increase in the production of beef cattle in the United States will come from the establishment of small herds on many farms, rather than of large herds on extensive areas; and it was maintained that no considerable area offers more favorble conditions for beef production than the corn belt, and hence that that section holds the key to the solution of the cattle situation.

The Economic Aspects of Meat Production and Marketing were treated by Prof. L. D. Hall, of the U. S. Department of Agriculture, who showed that while there has been an apparent decrease in meat animals, due in part to the method of census taking, a reaction has taken place in the last two or three years in favor of a restocking of farms. This was cited to show the readiness with which the industry can respond to the stimulus of increased returns.

The present problem of marketing was stated to relate in very large measure to the great central markets, at which more than half of the cattle, two-thirds of the swine, and approximately four-fifths of the sheep of the country are slaughtered. The situation is further complicated by the fact that the financing of live stock production and feeding, especially of cattle and sheep, is largely centralized in these market centers; by the periodicity in the marketing of certain classes and grades of live stock, which gives buyers the advantage; and by the custom of consigning the bulk of the stock to the markets on one, two, or three days of the week. "It is evident that every effort should be exerted to take up the slack in a system that contemplates raising a steer in Texas, grazing him in Montana, fattening him in Iowa, selling him in Chicago, slaughtering him at New York, and sending surplus fresh cuts in refrigerator cars as far west as the Missouri River." A tendency was noted to develop local slaughtering and packing industries and farmers' cooperative packing companies. The marketing of live stock, particularly of hogs, is coming to be regarded as the limiting factor of their production.

One of the greatest needs of the live stock industry, it was pointed out, is more complete official information for growers and feeders as to the supply and distribution of meat animals, both fat stock and feeders, the movement of live stock, quotations at the various markets based on standard classes and grades, and the stocks of fresh meats and meat products at principal points. Such information, it was maintained, would contribute very materially to the stability of conditions and give the producer a truer understanding of the economics of his business.

Dr. A. R. Ward, of the Bureau of Animal Industry, discussed the topic of Disease Control as a Factor in Meat Production. In this he showed the enormity of the direct loss from animal diseases, estimated to amount to approximately $212,000,000 annually. About 58 per cent of the meat and meat animals are slaughtered under federal inspection, which furnishes a reliable means of studying the ravages of animal diseases. The greatest losses are from diseases that have been demonstrated to be preventable and controllable. Nearly two per cent of the animals slaughtered under federal inspection in 1914 were condemned in whole or in part on account of disease. Tuberculosis caused the largest number of condemnations and hog cholera next. The burden which these losses impose on the meat producing industries of the country was emphasized. The blighting effect of Texas fever upon a large section of the country was also referred to, and the success in the campaign for eradication

of the tick, started in 1906, was pointed out. As a result of this campaign 253,000 square miles, or about one-third of the area, has been freed of ticks. Other diseases mentioned as exacting an immense toll on the stock industry of the country were contagious abortion in cattle, blackleg, and foot-and-mouth disease.

The importance of the control of animal diseases in relation to the production of meat and the live stock industry was summed up in the statement that "the good judgment and knowledge possessed by the individual producer of animal food products concerning the diseases of his animals will determine his success."

Director W. H. Jordan, of the New York State Experiment Station, has been chosen vice-president of the section for the present year.

American Society of Animal Production.—The seventh annual meeting of this association was held at Manhattan, Kans., December 22 and 23, 1915.

President H. J. Waters, of the Kansas College, gave an address entitled The Use of Food by Swine, in which he summarized results of work at the Kansas Station on supplements to corn. A paper by E. B. Hart and E. V. McCollum discussed The Influence of Strictly Vegetable Diets on the Growth and Reproduction of Swine, showing on the basis of work at the Wisconsin Station much more favorable results from a mixed grain ration plus meat than on the grain ration alone.

A paper on the inheritance of fertility in swine was presented by E. N. Wentworth and C. E. Aubel of the Kansas Station. This paper dealt with a statistical study of over 3,500 litters of Poland Chinas.

One session was devoted to a discussion of courses of study in animal husbandry. E. S. Savage, of Cornell University, made a plea for greater attention to the fundamental sciences in training for prospective teachers and investigators. W. A. Cochel, of Kansas, urged an ample preparation in agronomy. W. C. Coffey, of Illinois, contended that the so-called practical subjects should be retained in the curriculum but not permitted to dominate it.

Officers were elected as follows: President, W. A. Cochel, of Kansas; vice-president J. M. Evvard, of Iowa; and secretary-treasurer, F. B. Morrison, of Wisconsin.

Miscellaneous.—The Entomological Society of America met at Columbus, Ohio, December 29 and 30, 1915. Officers were elected as follows: President, F. M. Webster of this Department, whose subsequent death has been noted; vice-presidents, E. P. Felt, of New York and A. L. Melander, of Washington; secretary-treasurer, J. M. Aldrich, of Indiana; and additional members of the executive committee, H. T. Fernald, of Massachusetts, W. E. Britton, of Connecticut, P. J. Parrott, of New York, and C. G. Hewitt, of Canada.

The Florida Entomological Society has been organized with 15 charter members and the following officers: President, J. R. Watson, of the Florida Station; vice-president, Wilmon Newell, of the State Plant Board; and secretary-treasurer, R. N. Wilson, of this Department.

The American Association of Agricultural College Editors is to hold its fourth annual conference at the Kansas State Agricultural College, June 21 to 23.

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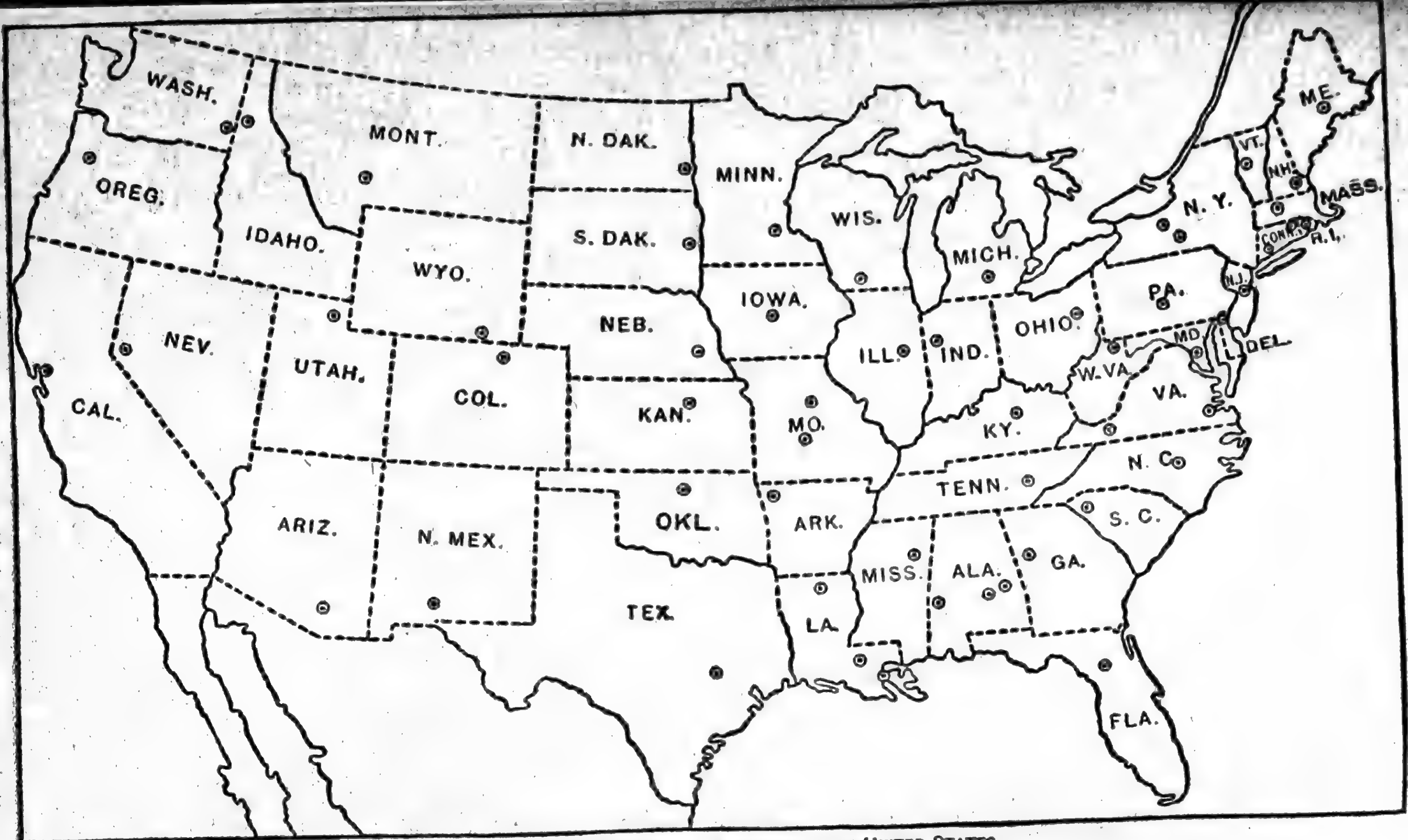

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FOREST SERVICE—H. S. Graves, *Forester.*
BUREAU OF SOILS—Milton Whitney, *Chief.*
BUREAU OF CHEMISTRY—C. L. Alsberg, *Chief.*
BUREAU OF CROP ESTIMATES—L. M. Estabrook, *Statistician.*
BUREAU OF ENTOMOLOGY—L. O. Howard, *Entomologist.*
BUREAU OF BIOLOGICAL SURVEY—H. W. Henshaw, *Chief.*
OFFICE OF PUBLIC ROADS AND RURAL ENGINEERING—L. W. Page, *Director.*
OFFICE OF MARKETS AND RURAL ORGANIZATION—C. J. Brand, *Chief.*

STATES RELATIONS SERVICE—A. C. True, *Director.*
OFFICE OF EXPERIMENT STATIONS—E. W. Allen, *Chief.*

THE AGRICULTURAL EXPERIMENT STATIONS.

ALABAMA—
College Station: *Auburn;* J. F. Duggar.[a]
Canebrake Station: *Uniontown;* L. H. Moore.[a]
Tuskegee Station: *Tuskegee Institute;* G. W. Carver.[a]
ALASKA—*Sitka:* C. C. Georgeson.[b]
ARIZONA—*Tucson:* G. F. Freeman.[c]
ARKANSAS—*Fayetteville:* M. Nelson.[a]
CALIFORNIA—*Berkeley:* T. F. Hunt.[a]
COLORADO—*Fort Collins:* C. P. Gillette.[a]
CONNECTICUT—
State Station: *New Haven;* } E. H. Jenkins.[a]
Storrs Station: *Storrs;* } E. H. Jenkins.[a]
DELAWARE—*Newark:* H. Hayward.[a]
FLORIDA—*Gainesville:* P. H. Rolfs.[a]
GEORGIA—*Experiment:* R. J. H. De Loach.[a]
GUAM—*Island of Guam:* A. C. Hartenbower.[b]
HAWAII—
Federal Station: *Honolulu;* J. M. Westgate.[b]
Sugar Planters' Station: *Honolulu;* H. P. Agee.[a]
IDAHO—*Moscow:* J. S. Jones.[a]
ILLINOIS—*Urbana:* E. Davenport.[a]
INDIANA—*La Fayette:* A. Goss.[a]
IOWA—*Ames:* C. F. Curtiss.[a]
KANSAS—*Manhattan:* W. M. Jardine.[a]
KENTUCKY—*Lexington:* J. H. Kastle.[a]
LOUISIANA—
State Station: *Baton Rouge;* } W. R. Dodson.[a]
Sugar Station: *Audubon Park, New Orleans;* } W. R. Dodson.[a]
North La. Station: *Calhoun;* } W. R. Dodson.[a]
MAINE—*Orono:* C. D. Woods.[a]
MARYLAND—*College Park:* H. J. Patterson.[a]
MASSACHUSETTS—*Amherst:* W. P. Brooks.[a]
MICHIGAN—*East Lansing:* R. S. Shaw.[a]
MINNESOTA—*University Farm, St. Paul:* A. F. Woods.[a]
MISSISSIPPI—*Agricultural College:* E. R. Lloyd.[a]
MISSOURI—
College Station: *Columbia;* F. B. Mumford.[a]
Fruit Station: *Mountain Grove;* Paul Evans.[a]
MONTANA—*Bozeman:* F. B. Linfield.[a]
NEBRASKA—*Lincoln:* E. A. Burnett.[a]
NEVADA—*Reno:* S. B. Doten.[a]
NEW HAMPSHIRE—*Durham:* J. C. Kendall.[a]
NEW JERSEY—*New Brunswick:* J. G. Lipman.[a]
NEW MEXICO—*State College:* Fabian Garcia.[a]
NEW YORK—
State Station: *Geneva;* W. H. Jordan.[a]
Cornell Station: *Ithaca;* B. T. Galloway.[a]
NORTH CAROLINA—
College Station: *West Raleigh;* } B. W. Kilgore.[a]
State Station: *Raleigh;* } B. W. Kilgore.[a]
NORTH DAKOTA—*Agricultural College:* T. P. Cooper.[a]
OHIO—*Wooster:* C. E. Thorne.[a]
OKLAHOMA—*Stillwater:* W. L. Carlyle.[a]
OREGON—*Corvallis:* A. B. Cordley.[a]
PENNSYLVANIA—
State College: R. L. Watts.[a]
State College: Institute of Animal Nutrition; H. P. Armsby.[a]
PORTO RICO—
Federal Station: *Mayaguez;* D. W. May.[b]
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SOUTH DAKOTA—*Brookings:* J. W. Wilson.[a]
TENNESSEE—*Knoxville:* H. A. Morgan.[a]
TEXAS—*College Station:* B. Youngblood.[a]
UTAH—*Logan:* E. D. Ball.[a]
VERMONT—*Burlington:* J. L. Hills.[a]
VIRGINIA—
Blacksburg: W. J. Schoene.[c]
Norfolk: Truck Station; T. C. Johnson.[a]
WASHINGTON—*Pullman:* I. D. Cardiff.[a]
WEST VIRGINIA—*Morgantown:* J. L. Coulter.[a]
WISCONSIN—*Madison:* H. L. Russell.[a]
WYOMING—*Laramie:* C. A. Duniway.[a]

[a] Director. [b] Agronomist in charge. [c] Acting director.

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Stations in the United States.

U. S. Department of Agriculture.

[a] Printed in scientific and technical publications outside the Department.

EXPERIMENT STATION RECORD.

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The feeling that there is an antagonism between science and what is designated as " common sense " still finds expression. It is a feeling that the two are not only quite different but are in some way opposed to each other, or not equally dependable from a practical point of view; and that common sense must be the test of all proposals and the mainstay of the practical man. It is a survival of the idea long held that science is a kind of hobby, chiefly for the men who pursue it; that while it may throw light on the abstruse problems of the universe it is not to be the guide of the practical man, and that its adherents are impractical.

While this view has been very greatly modified as a result of the work of our agricultural institutions, it still persists to some extent even among those who appreciate and follow the work of agricultural investigation; and it has to be met by experiment station men and extension workers. It is a failure to understand the nature of science. It confuses science with theory, and regards the term " scientific " as synonymous with theoretical. Theory and hypothesis aid in the development of scientific knowledge, but pure theory is not science nor is science mere theory.

It is natural that farmers who have developed their industry from experience and out of their own self-reliance should often look askance at proposals which they can not understand and can not subject to their usual method of test. Their reliance on their common sense is not a thing to be criticized, nor the fact that they may require to be convinced of the practical value of science in their business. The main thing to be desired is that they should maintain an open mind and estimate each kind of guidance fairly and on its own merits. This is not done at the present stage if the findings of science are dismissed as theoretical and visionary, and as a matter of course inferior to the product of practical judgment. The essential thing is an open mind, which while exercising the best of common sense will not shut out the evidence.

An illustration of the feeling that science is not common sense but something far more subtle and ethereal not infrequently crops out on occasions where agricultural workers are called upon to explain the character and practical applications of their activity.

While a gratifying degree of tolerance is commonly exhibited toward the scientific aspects of the work, the speakers are repeatedly brought back to the "common sense" plan or theory or view, and are called upon to justify their statements on "a common sense basis." The intimation often is that science has no part in the latter, but that viewed in such a light the science is usually found visionary and not a thing to be followed. The "common sense proposition," on the other hand, is the test applied and is apparently thought of as the reliable and practical one, and as usually opposed to suggestions developed through investigation. In such instances science has little real standing unless it chances to accord with the prevailing idea of common sense, despite the fact that what was supposed to be common sense in farming has often been found in error.

Perhaps this is merely a reflection of a feeling that science is not practical—at least until it has been proved so by this arbitrary measure, and that it is devoid of some quality which enters into good common sense; a belief that man gets his practical knowledge by another means, and relies on his shrewd judgment and intuition.

A similar idea was carried in a recent review of a bulletin in a farm paper. In speaking of the attitude of the author the editor remarked: "Nor do we care how unscientific he may be so long as he is practical." This was probably a careless statement, intended to lay special stress on the importance of an experimenter being practical, rather than to encourage unscientific writing. The idea that a station man may be practical although unscientific is contrary to the underlying thought of experiment station work, as is likewise the suggestion that a fact or a rule of practice may be unscientific and yet practical. We may not fully understand the scientific principles underlying the practice, but this does not admit that there is a possible antagonism between them or an absence of principle. It is fundamental that all sound practice accords with scientific principles and facts as soon as we are able to determine them.

What is commonly designated as common sense is the result of practical experience, coupled with sound judgment and often with good business instinct. Its basic quality is judgment, which in turn depends on information, and its most prominent attribute is that it is supposed to be practical and has in it the elements of success. It is thought of as an individual quality, acquired rather than taught, and often supposed to combine a degree of intuition or unusual sagacity.

It is not formulated in definite terms, and the elements which comprise it in particular cases often could not be analyzed or enumerated. Hence, it is absorbed rather than learned, and it is passed on by that means and by imitation. Common sense is popularly looked on as

something developed from the resources within the individual. The information on which it is based is usually regarded as personal and as having come out of experience and shrewd reasoning. There is little discrimination between such information and that which has been absorbed from reading, institute lectures, and the like. Indeed, many a man credited with large common sense probably does not realize the actual source of his information and power.

Common sense, whether of high or low degree, is in effect a product of reason and judgment applied to the facts and conditions as they are seen. It rests upon information and its interpretation. So does science. There is some very bad common sense, as there may be bad science.

Scientific facts are derived more accurately than personal impressions, by providing conditions which tend to guard against error or misconstruction. Because the facts developed by scientific methods are accurate, dependable, unprejudiced, and not influenced by purely local conditions, they furnish a safe basis for intelligent reasoning along either practical or scientific lines. The scientific method of deduction is more cautious and more restricted in its generalizations than personal judgment may be, but as far as it goes there is nothing antagonistic in it to good common sense. The substitution of facts derived in a manner to make them thoroughly reliable, in the place of current notions, traditions and observations, instead of detracting from the practical value and reliability of personal judgment strengthens it and makes it a safer basis for action.

There is no reason why the practical man's judgment should not be based on the best and safest sources of information available, and this is exactly what is taking place, whether it is fully realized or not. As a matter of fact, science is becoming more and more an aid to sane and logical practical judgment in agricultural affairs. The more science furnishes the means for intelligent understanding and this understanding becomes disseminated among the people, the more common and reliable may "common sense" be, and the further will it be removed from the elements of mysticism, superstition, and dogma. Confidence in it will not suffer by reason of this change, for it will then rest upon intelligence in the things that actually are, combined with sound judgment and clear thinking.

There will always be abundant call for the exercise of keen judgment in every branch of farming—not that science is unpractical but that its application may not be practical or economic under a given set of conditions. It has not always been given a practical interpretation or harmonized with the conditions of practical farming. Our science, so far as it is recommended to the practical man, should be able to stand the common-sense test, i. e., the test of practical trial or of good practical judgment. If it does not, the fault

is probably with its application or its interpretation in practice rather than with the science itself. But it is becoming more practical and dependable every year, and it is the most reliable basis of information available to the agricultural industry.

So far from being incompatible or antagonistic, therefore, science and common sense supplement each other in forming practical judgment, and as the former becomes disseminated it enters more and more largely into the composition of the latter. The two are not to be contrasted or set over against each other, or thought of as something essentially different in kind. It is very evident that through the years practical experience and judgment unaided have not proved an adequate basis for progress; and our present experience is demonstrating that the more science there is incorporated in common sense, the sounder will it be. The more the farmers can be brought to see and understand this, the easier will extension teaching become, because the attitude will be more receptive.

Those who are in close contact with the farming people are conscious of a very decided change in the great body of them, in the attitude toward science itself, as well as toward its teachings. Along with the growing appreciation and expectation of science has come a deeper understanding of it and of its nature. It manifests itself in something more than confidence in science and a readiness to accept its teachings. It is an evidence of the wider growth of the science spirit, a gathering of something of the spirit of science by the people, not necessarily a conscious change or recognized under that name, but evident in a broadening of views and a change in attitude.

It is a natural result of association. It has come with a wider familiarity with science and its methods, with the development of it, and with an almost daily association with it in practice and reasoning. It is an effect on the man himself and his mental habit. To him science is no longer for a special class or merely of theoretic interest; but it is practical, it is for use, and it is within the reach and understanding of busy practical men.

No one can come to something of an understanding of science and associate it with his daily life without being influenced by it. It is not merely employed in a thoughtless routine way, but it becomes a part of him just as his practical experience is, and it affects his outlook and attitude toward new things, just as it does his action. It makes him more critical and discriminating in regard to the source of new information, it breaks down his prejudices, and it strengthens his judgment and "hard common sense." Instead of leading him to follow rules blindly it makes him think and reason intelligently; it develops an inquiring habit, a desire to understand.

This is illustrated by an old farmer in the South who, in describing a method he was following in putting in a crop, said: "I know this method gives the best result but I wish I knew why." Until recently the theory of agriculture and the rule of practice was dogmatic. It was based on some one's opinion, frequently crystallized into a tradition, without the actual facts. The average man did not distinguish facts from notions or opinions. These were a result of general observation and experience. Experience is as good a basis for facts and for truth as any other, so it is rightly gathered and interpreted, without prejudice or preconceived idea. But very often this has not been the case.

The farmer has learned through his association with science the difference between dogma based on assertion and a true fact. The thinking farmer of to-day does not accept some man's dictum unless he has the facts. He has had impressed upon him the danger of half truths; he expects the man who advises him to have the facts behind him, not ahead of him. He finds facts more valuable and impressive than argument. The truth is what is wanted by the large body of farmers, and the demonstration of this rather than its assertion is the strength of extension teaching. The acceptance of new facts has aroused reason and created an open mind. As has been said, "long-continued practice solidifies opinion and makes it impregnable to evidence. We come at length to substitute habit for reason." The introduction and acceptance of new ideas breaks up this habit.

The man of scientific mind seeks to know the facts first of all; he makes his inquiries long before he has an opinion. He realizes the importance of this. A large body of farmers is coming to realize it also. To a greater degree than ever before it is recognized that "we can not solve our questions by unscientific polemics, however much we may settle them for the time being." Carefully collected evidence has become the basis for conclusions and theories, and these viewed in the spirit of science remove the fear of truth and the fear of dogma.

In a very large measure, then, the farmer has come to a realization that science is for him in his daily life; that he is to "practice with science," and that its influence on his method of thought and open-minded attitude is hardly less than its practical results. In other words, that truth is valuable not only on its own account but for the range and reach it imparts to the mind.

These things have come about very largely from the work of the experiment stations, and especially as a result of the experimental method. The change began when the experiment stations began to apply the test of science to tradition and to dogma, and employ the

method of science in getting at the truth. The farmers began to see the difference and to catch something of its meaning. It was the application of the experimental method in determining facts. This difference between opinion and fact has been propagated more and more widely each year, through the teachings of the agricultural colleges, short courses, the farmers' week, the movable schools, the agricultural press, and all those agencies which have been so influential in disseminating information and understanding.

There has been no more significant development in agriculture in all time than the acceptance during the past quarter of a century of the truth that scientific experiment and research are the most effective means for determining methods of improving and safeguarding agricultural production, and that the profits of agricultural practice depend upon the operation of economic laws and the management of agricultural operations in accordance with business principles. Such a widespread acceptance could not have resulted if some measure of the spirit of science had not been caught by the large body of the people.

Naturally the spread of the science spirit is not restricted to the business and practice of farming. It affects the entire man, and is felt throughout the whole horizon of life in a broader attitude toward questions relating to public welfare. This is indeed a great gain for scientific research and science teaching.

RECENT WORK IN AGRICULTURAL SCIENCE.

AGRICULTURAL CHEMISTRY—AGROTECHNY.

Theoretical and physical chemistry, S. L. Bigelow (*New York: The Century Co., 1914, pp. XIII+544, figs. 81*).—A volume intended for use in a course of lectures on elementary theoretical and physical chemistry, and of general interest to agricultural chemists.

International catalogue of scientific literature. D—Chemistry (*Internat. Cat. Sci. Lit., 12 (1915), pp. VIII+910*).—The twelfth annual issue of this catalogue (E. S. R., 33, p. 201), which contains schedules and indexes in four languages and a subject and an author catalogue. The material catalogued was received between October, 1912, and September, 1913.

A study of the chemical and physical properties of oils distilled from the various parts of the plant Acorus calamus, G. A. Russell (*Jour. Amer. Chem. Soc., 37 (1915), No. 10, pp. 2387–2394, fig. 1*).—*Acorus calamus*, commonly known as "calamus," when cultivated on upland soils yields less oil than when grown in its natural habitat, which is low, wet, and boggy. While all parts of the plant yield oil, the roots show the largest percentage yield. The oils obtained by steam distillation from the various parts of the plant, viz, aerial, rhizome, and roots, possess varying physical and chemical constants. Qualitative tests showed phenols to be absent in all of the samples. Aldehydes, however, were found in all of the oils, and "it may be inferred that the production of aldehydes is greatest in the part of the plant exposed to the action of sun and air, and that this production diminishes as these factors are more or less shut off." Fractionation of these oils indicates that the components of each are present in varying amounts, and that the components themselves vary to some extent.

Oxidation and polymerization of soy-bean oil, N. J. A. Taverne (*Ztschr. Angew. Chem., 28 (1915), No. 42, Aufsatzteil, pp. 249–251*).—Oxidation in the air at room temperature was carried out by Fahrion's method, and the hydroxy acids determined after 30 days' exposure were found to constitute 38.4 per cent of the oil. Oxidation at 70° C. was carried out in the apparatus of Genthe[a] and was complete in 30 hours.

Oxidation in air at 150° was also carried out by heating in a beaker. The molecular weight rose in 10 days from 710 to 1,730. This indicated polymerization or condensation along with the oxidation. The oil became solid and assumed a reddish-brown color. It contained 31.8 per cent hydroxy acids and 63 per cent fatty acids soluble in petroleum ether. The iodin number decreased to 64.8. Heating for 14 days at 135° gave a thick oil containing 27.2 per cent hydroxy acids and 65.5 per cent fatty acids with an iodin number of 65.7. These figures indicate the possibility of using soy-bean oil in the linoleum industry.

[a] Ztschr. Angew. Chem., 19 (1906), No. 51, pp. 2087–2099, figs. 21.

Contrary to the findings of Genthe the author obtained complete oxidation in 45 hours in ultraviolet rays. A lead-manganese rosin compound containing 6.28 per cent lead and 5.76 per cent manganese was found to be the most active agent for hastening oxidation.

Soy-bean oil is readily polymerized, though not to so great a degree as linseed oil. On heating the oil at 150° in an air bath the iodin number was found to have decreased from 137.5 to 90.5, while the molecular weight remained constant and the oil liquid. Higher temperatures gave no better results. By adding 30 per cent of linolic acid to the oil and heating to 250° the iodin numbers were reduced but the oil remained liquid. Heating the oil at 300° for 12 days caused it to become solid, and after 17 days to become insoluble in benzene. The molecular weight of a sample heated for 10 days at 300° rose to 1,200. Adding 1 per cent oxidized soy-bean oil to fresh oil and heating to 300° caused the mass to become solid in 7 days.

The isomeric tetracetates of xylose, and observations regarding the acetates of melibiose, trehalose, and sucrose, C. S. HUDSON and J. M. JOHNSON (*Jour. Amer. Chem. Soc., 37 (1915), No. 12, pp. 2748–2753*).

Bromoacetylxylose and beta-triacetylmethylxylosid, J. K. DALE (*Jour. Amer. Chem. Soc., 37 (1915), No. 12, pp. 2745 2747*).

The preparation of melibiose, C. S. HUDSON and T. S. HARDING (*Jour. Amer. Chem. Soc., 37 (1915), No. 12, pp. 2734–2736*).—Following the main lines of Loiseau's method uniform yields of from 175 to 200 gm. of melibiose were obtained from 500 gm. of pure raffinose (E. S. R., 32, p. 711). The product was colorless and gave a correct value for its specific rotation.

A second crystallin δ-fructose pentacetate (α-δ-fructose pentacetate), C. S. HUDSON and D. H. BRAUNS (*Jour. Amer. Chem. Soc., 37 (1915), No. 12, pp. 2736–2745*).

The effect of sodium chlorid upon the action of invertase, H. A. FALES and J. M. NELSON (*Jour. Amer. Chem. Soc., 37 (1915), No. 12, pp. 2769–2786, figs. 4*).—The experimental data indicate that the hydrogen ion concentration remains constant throughout the whole course of the inversion of cane sugar by invertase.

"At the optimum of invertase action, the salt effect of the sodium chlorid seems to approach zero, and as we depart either side from the optimum we get an increasing salt effect. The use of buffers (tampons) for regulating the concentration of hydrogen ion introduces a certain salt effect. The most satisfactory region for using buffers in invertase velocity measurements is in the neighborhood of the optimum zone where the salt effect is a minimum. In the region of enzym activity it is necessary to measure the concentration of hydrogen ion, and it is not permissible to calculate it from the molarity of acid used. The addition of sodium chlorid to solutions of hydrochloric acid causes an increase in the concentration of hydrogen ion as measured by the electromotive force method and by the hydrolysis of cane-sugar solutions."

Acid potassium and acid sodium phthalates as standards in acidimetry and alkalimetry, W. S. HENDRIXSON (*Jour. Amer. Chem. Soc., 37 (1915), No. 10, pp. 2352–2359*).—The salts have been applied as acidimetry and alkalimetry standards. It has been observed by the author that "the results obtained by using silver, benzoic acid, and the two acid phthalates as standards are almost identical. So far as the results go they indicate that one of the organic standards is as good as another in point of accuracy. The acid phthalates have some advantage in their much higher molecular weights, their greater solubility, and the fact that they can be prepared pure and true to the formulas accepted for the anhydrous salts without the use of unusual and time-consuming methods of purification."

Two methods of separation of the metals of the alkaline-earth group, ALICE G. PATERSON (*Jour. Amer. Chem. Soc., 37 (1915), No. 10, pp. 2346–2352*).—The methods devised are based on the slight differences in solubility of the relatively insoluble salts of the group, both being applications of the principle involved in fractional precipitation. If two or more precipitating agents are added to a solution containing a mixture of salts, any given metallic ion will unite with that acid ion which forms the least soluble salt.

Detailed procedures for the qualitative separation of the alkaline-earth metals, based on the above principle, are given. It is thought that the principle may have a wider application in general analytical work and may perhaps be valuable for quantitative separations.

Nephelometric estimation of phosphorus, P. A. KOBER and G. EGERER (*Jour. Amer. Chem. Soc., 37 (1915), No. 10, pp. 2373–2381, figs. 2*).—The reagent of Pouget and Chouchak (E. S. R., 20, p. 703; 21, p. 105) for the estimation of phosphorus has been so modified by the authors as to be stable, colorless, and both quantitatively and nephelometrically applicable. The preparation of reagents and detailed procedure for the estimation of phosphorus is described. The authors have shown that 0.005 mg. of phosphorus in 10 cc. of solution, or 1 part in 2,000,000 parts of water, is easily determined quantitatively with the nephelometer (E. S. R., 30, p. 410). The method, as a rule, is applicable directly to any solution containing phosphates but no organic matter, provided the solution is neutral or slightly acid and not turbid.

On the accuracy of Neumann's method for the estimation of phosphorus, H. S. H. WARDLAW (*Jour. and Proc. Roy. Soc. N. S. Wales, 48 (1914), pt. 1, pp. 73–93*).—After a critical study of the possible sources of error in Neumann's method for the estimation of phosphorus, the author concludes that the values obtained in the estimation of phosphorus are always high. The error increases with the amount of phosphate estimated, and its source is an excess of molybdenum carried down in the precipitate of ammonium phosphomolybdate. The error is independent of the rate of addition of the precipitant or the time of contact between the precipitate and the mother liquor, and it can not be reduced by lowering the temperature of precipitation, as this leads to incomplete precipitation.

On the factor to be used for the calculation of the phosphoric acid in Neumann's method; the factor as influenced by the water used for washing the yellow precipitate, S. L. JODIDI and E. H. KELLOGG (*Jour. Franklin Inst., 180 (1915), No. 3, pp. 349–367*).—The authors have shown that the factor used for the calculation of phosphoric acid in Neumann's method is to a degree influenced by the amount of water used for washing the ammonium phosphomolybdate. Losses of from 1.07 to 3.95 per cent of the phosphorus employed were observed when washing the yellow precipitate with four successive portions of 150 cc. each of ice-cold water. By washing the precipitate with but three portions of 50 cc. each the losses were smaller, ranging from 0.89 to 3.2 per cent, and this procedure is recommended. The more material used in the method the smaller was the percentage of phosphorus lost in the filtrate and washings. Analytical data indicate that the ammonium phosphomolybdate is not absolutely insoluble in the liquid from which it is precipitated, the losses ranging in the experiments reported from 0.4 to 0.77 per cent of the phosphorus employed.

It has been found to be more convenient to use a 300-cc. round-bottom flask than a 500 to 750 cc. flask for the formation of the yellow precipitate. A large flask, however, is necessary for the oxidation of organic matter if such be present.

See also a previous note (E. S. R., 33, p. 803).

The volumetric determination of phosphoric acid in calcium phosphate, I. M. Kolthoff (*Pharm. Weekbl., 52 (1915), No. 29, pp. 1053–1055*).—A weighed quantity of the phosphate is dissolved in dilute hydrochloric acid, rendered neutral to dimethylaminoazobenzene, and made up to a definite volume. A solution of disodium phosphate with the indicator is recommended to be used for comparison. To an aliquot portion an excess of sodium oxalate neutral to phenolphthalein is added and the solution titrated with tenth-normal alkali. One cc. of tenth-normal alkali is equivalent to 7.1 mg. P_2O_5. The presence of carbonate in the phosphate does not interfere with the determination.

The method may also be applicable to the determination of phosphorus in urine.

Detection of various mineral and alkaloidal poisons in waters, P. Breteau (*Jour. Pharm. et Chim., 7. ser., 12 (1915), No. 3, pp. 68–73*).—A procedure for the separation of alkaloidal from mineral poisons in waters is outlined, and tests for the detection of certain alkaloids (brucin, colchicin, atropin, morphin, strychnin, and veratrin) in the water are given. The separation of copper, antimony, arsenic, barium, mercury, lead, zinc, and the cyanids is described in detail.

The determination of gases dissolved in waters and effluents, A. A. Swanson and G. A. Hulett (*Jour. Amer. Chem. Soc., 37 (1915), No. 11, pp. 2490–2500, figs. 2*).—The authors describe two new pieces of apparatus, illustrated by figures, for the determination of dissolved gases in water. Procedures for the determination of oxygen, carbon dioxid, and nitrogen are given. The experimental data submitted indicate that great accuracy is possible with the method.

The determination of nitrogen contained in vegetable matter according to the Gunning-Atterberg method, A. N. Lebediantzev (*Zhur. Opytn. Agron., 16 (1915), No. 2, pp. 95–105*).—Experiments by the author show that a loss of nitrogen in the method (E. S. R., 10, p. 605) occurs when the correlation between sulphuric acid and potassium sulphate becomes too narrow. This loss can be obviated by using an abundant amount of potassium sulphate and by increasing the amount of the sample used in the determination. For material rich in fat 1.5 gm. sample is recommended; for other materials, 2 gm. There is no loss of nitrogen from boiling for various lengths of time after the oxidation is complete provided long-necked Kjeldahl flasks are used. The substances used in the experiments were rye, wheat, maize, flax, potatoes, red beets, and seeds of the poppy, flax, and sunflower.

Determination of chlorin in vegetable matter, D. J. de Jong (*Chem. Weekbl., 12 (1915), No. 26, pp. 592–594; abs. in Chem. Abs., 9 (1915), No. 17, p. 2363*).—The sample, usually from 10 to 15 gm., is treated with 10 cc. of a 10 per cent solution of sodium carbonate. The material is then ignited and chlorin determined in the melt in the usual manner. By this procedure there is no loss by volatilization.

The determination of volatile esters in citrus oils and extracts, A. R. Albright and C. O. Young (*Jour. Amer. Chem. Soc., 37 (1915), No. 10, pp. 2382–2387*).—Condensation with semicarbazid is recommended as a general procedure preliminary to the determination of the saponification value of oils when aldehydes are present. For the determination of the volatile esters the authors propose the following manipulation:

"First, the terpene fraction is removed as follows: One hundred gm. of the oil is weighed into a three-bulb Ladenburg flask, the flask hung in a hemispherical iron air bath, connected with a pump producing a vacuum of from 2 to 5 mm., a small flame placed below, regulated to give a slow rate of distillation (not exceeding from 18 to 20 drops per minute), and the process not disturbed until limonene ceases to come over.

"When the automatic stopping of the vacuum distillation has taken place, the flask is connected with a long condenser, and a current of steam passed through until the volume of the distillate reaches 200 cc. This distillation is so regulated as to consume at least from 30 to 45 minutes. The volume of material in the flask is kept as nearly constant as possible by heating with a flame. When the steam distillation is carried out in less time than this, it is almost invariably found that a sufficient amount of less readily volatile material is driven over to produce murkiness and to interfere seriously with the titration. The same effect is observed when the volume of oil with water in the flask becomes too low. When a large volume of water accumulates in the flask, the results appear to be too low, due to incomplete volatilization of the ester. The steam distillates are always found to be slightly acid to phenolphthalein, but no relation between this acidity and the saponification value has been observed.

"A concentrated aqueous solution of the theoretical quantity, or an excess of semicarbazid hydrochlorid with an equivalent amount of crystalline sodium acetate, is now added. This is calculated from the aldehyde content, determined previously by Hiltner's method.[a] When an insufficient amount is used, the end point is not sharp. One hundred cc. of 95 per cent alcohol is then added, the mixture shaken around for a few minutes, and allowed to stand for from 10 to 15 minutes, or longer if convenient. A large bulk of citral semicarbazone usually separates at this point. The solution is then neutralized to phenolphthalein, 50 cc. half-normal alcoholic KOH added, and the solution boiled under a reflux for 2 hours. At the end of this time it is cooled to room temperature without delay, under tap water, and the excess alkali titrated with half-normal hydrochloric acid. It is necessary to use a much larger quantity of phenolphthalein than in ordinary titrations. Using a 100-gm. sample, the number of cubic centimeters of half-normal alkali consumed, multiplied by 0.098 (the value in grams of 1 cc. half-normal linalyl acetate), and an empirical factor [1.28] gives the percentage of saponifiable matter present, calculated as linalyl acetate."

When applied to lemon extracts the procedure is as follows:

"Four hundred gm. is distilled slowly from an ordinary side-neck flask until the volume is reduced to from 50 to 75 cc. Steam is then passed through until no more volatile oil comes over. The combined distillates are then treated exactly as the steam distillate in the case of lemon oils, calculating the necessary amount of semicarbazid from the citral value (1 gm. citral requires about 0.75 gm. semicarbazid hydrochlorid)."

Experimental data obtained from mixtures of known composition indicated that the method is quite accurate.

A disturbing factor in Barfoed's test, W. H. WELKER (*Jour. Amer. Chem. Soc., 37 (1915), No. 9, pp. 2227–2230*).—In using Barfoed's test[b] to determine the hydrolytic products of the action of hydrochloric acid on starch, the author found it impossible to produce the typical glucose reaction but obtained a greenish-white precipitate. The sodium chlorid present, formed by the neutralization of the free hydrochloric acid with sodium hydroxid, seemed to be the interfering substance. A greenish-white precipitate was formed instead of the red cuprous oxid of the typical Barfoed's test when a solution of sodium chlorid was boiled with Barfoed's reagent, or when sodium chlorid was added to a solution of pure glucose and Barfoed's test was applied to the mixed solution.

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[a] U. S. Dept. Agr., Bur. Chem. Bul. 132 (1910), p. 102; Jour. Indus. and Engin. Chem., 1 (1909), No. 12, pp. 798–800.

[b] Jour. Biol. Chem., 6 (1909), pp. XXXIII–XXXIV.

The experimental data indicate that percentage concentrations of sodium chlorid as low as 0.0156 interfere with the test.

In determining the delicacy of Barfoed's test it was found that with 1 cc. of the reagent, and heating for two minutes in boiling water, a concentration of 0.08 per cent of glucose gave a very definite reduction, and that one-half the concentration gave a faint reduction. The greenish-white precipitate was formed by the action of sodium chlorid (concentration of 0.32 per cent) on Barfoed's reagent at room temperature. Glucose has the same effect in the presence of sodium chlorid at room temperature. The precipitate contains copper, sodium, chlorin, and the acetic acid radical. When formed at room temperature it tends to go into a colloidal solution. Its percentage composition was not determined.

The quantitative determination of the amino acids of feeding stuffs by the Van Slyke method.—II, H. S. GRINDLEY, M. E. SLATER, ET AL. (*Jour. Amer. Chem. Soc., 37 (1915), No. 12, pp. 2762–2769*).—Results of the distribution of the nitrogen of blood meal, wheat, rolled wheat, barley, oats, and white soy beans are reported, together with those previously noted (E. S. R., 33, p. 805).

The results reported "confirm the conclusion previously drawn, namely, that the Van Slyke method for the determination of the chemical groups characteristic of the amino acids of proteins can be applied directly to the quantitative determinations of the amino acids of feeding stuffs with at least a fair degree of accuracy." Pronounced variations in the free and combined amino-acid content of the common feeding stuffs, expressed in percentage of the total nitrogen and in percentage of the feeding stuffs, are indicated by the results reported. The high results for humin nitrogen obtained are deemed probably due in part to the presence of soluble carbohydrates during the hydrolysis of the proteins, and probably also to the presence of cellulose which mechanically prevents a complete hydrolysis of the material. These high results for humin nitrogen constitute a source of error in the direct application of the method to the determination of the free and combined amino acids and amids of feeding stuffs.

See also a previous note by Nollau (E. S. R., 33, p. 665).

The nephelometric estimation of purin bases, including uric acid, in urine and blood, SARA S. GRAVES and P. A. KOBER (*Jour. Amer. Chem. Soc., 37 (1915), No. 10, pp. 2430–2447, figs. 3*).—The authors have so modified Salkowski's reagent for purin bases as to make it applicable to nephelometrical work. They have found that the reagent will precipitate xanthin, hypoxanthin, guanin, adenin, and uric acid quantitatively in solution as dilute as 0.0002 per cent. The use of a clear solution of egg albumin as a protective colloid to keep the precipitates in suspension has been introduced. A suspension of manganese dioxid in alkaline rather than acid medium was found to oxidize uric acid completely in from one to three minutes and not attack the other purins. They conclude that uric acid and other purin bases in urine may be quickly and fairly accurately estimated with the nephelometer. An outline of the technique for the estimation of purin bases in blood is given.

The use of ammonium hydroxid for the extraction of rosin from wood, H. K. BENSON and H. N. CRITES (*Jour. Indus. and Engin. Chem., 7 (1915), No. 11, pp. 918–920, fig. 1*).—By the treatment of resinous woods with an amount of 5 per cent ammonium-hydroxid solution equal to eight times the weight of the wood, at 70° C. for five hours, an almost complete extraction of rosin was obtained. From the general properties of ammonia it is believed that a complete recovery of ammonia is possible.

METEOROLOGY.

Reorganization of the meteorological service in Brazil (*Diario Off., Estad. Unid. Brazil, 56 (1915), No. 61; Bul. Off. Bur. Renseig. Brésil à Paris, No. 33 (1915), pp. 12, 13; abs. in Internat. Inst. Agr.* [*Rome*], *Mo. Bul. Agr. Intel. and Plant Diseases, 6 (1915), No. 8, pp. 1024, 1025*).—Certain clauses of the decree of March 4, 1915, providing for the reorganization of this service indicate that more attention than heretofore is to be paid to work which has a direct bearing upon agriculture, such, for example, as the study of rainfall, droughts, and flow of streams, with special reference to the water supply for dry regions, and weather forecasts and warnings of special interest to farmers.

Reading the weather, T. M. Longstreth (*New York: Outing Publishing Co., 1915, pp. IV+195, pls. 8*).—This is one of the Outing Handbooks and deals with the commoner facts relating to the weather in a popular way, especially with reference to outdoor life.

Some Arabic weather sayings, Kasim (*Cairo Sci. Jour., 8 (1914), No. 97–98, pp. 209–238, pl. 1, fig. 1*).—This article is mainly a collection of weather sayings, but it also includes a compilation (mainly from almanacs and calendars in common use among the people) of notes bearing on meteorology and hydrography in association with the dates of the Coptic calendar, a general description of the climate of Egypt, and notes on the cause and character of the Nile floods.

Monthly Weather Review (*U. S. Mo. Weather Rev., 43 (1915), Nos. 9, pp. 437–494, pls. 14, figs. 4; 10, pp. 495–541, pls. 11, figs. 6*).—In addition to weather forecasts, river and flood observations, and seismological reports for September and October, 1915; lists of additions to the Weather Bureau Library and of recent papers on meteorology and seismology; notes on the weather of the months; a condensed climatological summary; and the usual climatological tables and charts, these numbers contain the following articles:

No. 9.—Solar and Sky Radiation Measured at Washington, D. C., during September, 1915; and Solar Radiation Measurements at Santa Fe, N. Mex., and Maxima at Other Stations (illus.), by H. H. Kimball; Halo Observations at York, N. Y., by M. N. Stewart; Cumulus Over a Fire, by E. N. Munns; Electricity of Atmospheric Precipitation, by G. C. Simpson; Aurora Observations in 1913, by C. Störmer; The Great Aurora of June 16, 1915, by E. E. Barnard; A Remarkable Fall of Hail in Maryland (illus.), by O. L. Fassig; Influence of a Forest on the Temperature of an Air Current, by L. M. Lalin; Organization of the Meteorological Office in London, by W. N. Shaw (E. S. R., 34, p. 319); Weather Bureau Exhibit at San Francisco, 1915 (illus.), by J. C. Alter; Memorandum by the Director of the Meteorological Office [London], by W. N. Shaw; The Tropical Hurricane of September 29, 1915, in Louisiana, by I. M. Cline; Condensation upon and Evaporation from a Snow Surface, by B. Rolf; Relation between Monthly Values of Atmospheric Pressure Variation and Simultaneous Monthly Values of Temperature Variation and Humidity, and Geographical Latitude, by N. Ekholm; Climatic Subdivisions of the United States (illus.), by R. DeC. Ward; and A Pacific Hurricane of September, 1915, by J. H. Kimball.

No. 10.—Solar and Sky Radiation Measured at Washington, D. C., during October, 1915, by H. H. Kimball; Effects of Hurricanes on the Upper Air Currents, by W. H. Pickering; 22° Halo with Upper and Lower Tangent Arcs (illus.), by C. G. Andrus; Experiment on Sunset Colors, by F. W. Jordan; Halo of May 20, 1915, Analyzed (illus.), by C. S. Hastings; Spectrum and Temperature of the Solar Photosphere, by A. Amerio; Effect of Ultra-Violet Light

on the Eye, by W. E. Burge; Rotation of Solar Corona, by J. Bosler; Rotation of Solar Corona, by H. Deslandres; Deflection of Bodies Moving Freely under Gravity on a Rotating Sphere (illus.), by C. F. Marvin; Cause of "Smoke" from Mount Hood (illus.), by F. D. Young; The Making of Forecasts by Laymen, by C. F. Marvin; Pennsylvania Weather and Climate in 1682; on Waterfall Electricity and on the Surface Condition of Liquids, by P. Lenard; Gage Aperture and Weight of Catch, by C. N. Haskins; Atmospheric-Electric Observations on the Third Cruise of the "Carnegie," 1914, by W. F. G. Swann; Foggy Days in Manchester, England, by W. C. Jenkins; Physical Conditions of the Accumulation of the Sun's Heat in the Salt Seas, by M. Rózsa; Absorption of Ultra-Violet and Infra-Red Radiations by Arable Soil, by J. F. Tristan and G. Michaud; Density of Oxygen, by A. F. O. Germann; Ordinary and Internal Seiches in Lake Tasawa, by K. Honda; Æolian Tones and Resistance of Small Plates in a Stream of Fluid, by Lord Rayleigh; and Selected Bibliography of Frost in the United States, by W. G. Reed and Cora L. Feldkamp.

Climatological data for the United States by sections (*U. S. Dept. Agr., Weather Bur. Climat. Data, 2 (1915), Nos. 9, pp. 224, figs. 7, pls. 2; 10, pp. 232, pls. 2, figs. 8*).—These numbers contain brief summaries and detailed tabular statements of climatological data for each State for September and October, 1915, respectively.

Meteorological observations at the Massachusetts Agricultural Experiment Station, J. E. Ostrander and D. Potter (*Massachusetts Sta. Met. Buls. 323, 324 (1915), pp. 4 each*).—Summaries of observations on pressure, temperature, humidity, precipitation, wind, sunshine, cloudiness, and casual phenomena during November and December, 1915, are presented. The general character of the weather for November is briefly discussed, and the December bulletin gives a summary for the year. The principal data in this summary are as follows:

Pressure, reduced to freezing and sea level (inches).—Maximum, 30.58, February 19; minimum, 28.85, December 26; mean, 29.992. *Air temperature*, in ground shelter (degrees F.).—Maximum, 93, September 9, 15; minimum, —4, January 5. *Humidity*.—Mean dewpoint, 38.8; mean relative humidity, 75.6. *Precipitation*.—Total rainfall or melted snow, 51.58; number of days on which 0.01 in. or more rain or melted snow fell, 122; total snowfall, 40.8 in. *Weather*.—Total cloudiness recorded by sun thermometer, 2,230 hours, or 50 per cent; number of clear days, 82. *Bright sunshine*.—Number of hours recorded, 2,224, or 50 per cent. *Wind*.—Prevailing direction, west-northwest; total movement, 50,486 miles; maximum daily movement, 555 miles, March 3; minimum daily movement, 1 mile, January 4; maximum pressure per square foot, 22 lbs., November 15, west-northwest. *Dates of frost*.—Last, May 20; first, September 23. *Dates of snow*.—Last, April 3; first, November 17.

Atmospheric circulation and radiation, F. H. Bigelow (*New York: John Wiley & Sons, 1915, pp. XI+431, figs. 78*).—This is a meteorological treatise on the circulation and radiation in the atmospheres of the earth and of the sun. It sets forth a new method of discussing meteorological problems, based upon a simple adjustment, devised by the author, "of the thermodynamic adiabatic equations found in all treatises to an exact and practical form of computation which will adapt them to the nonadiabatic system prevailing in the atmospheres of the earth and of the sun." The method is explained "with sufficient detail to enable the reader to utilize the formulas in practical computations."

The book contains a solution of the following problems "that have heretofore been intractable along the old lines of procedure: "(1) The diurnal convection and the semidiurnal barometric waves, with the radiation; (2) the

pressures and temperatures in cyclones and anticyclones, with the circulation and radiation; (3) the thermodynamics of the atmosphere from balloon ascensions to great altitudes; (4) the thermodynamics of the general circulation; (5) the distribution of the radiation in all latitudes and altitudes to 20,000 meters; (6) the 'solar constant' of radiation and the conflicting results from pyrheliometers and bolometers; (7) the discrepancy in the absolute coefficient of electrical conduction as derived from the several apparatus for dissipation, and for the number and velocity of the ions; (8) the diurnal magnetic variations in the lower strata of the atmosphere; (9) the nonperiodic magnetic variations in their relation to the solar radiation; (10) the magnetization and electrical terms in the sun at very high temperatures."

Variations in the intensity of the heat rays from the sun with the season of the year, H. H. Kimball (*Amer. Univ. Courier, 21 (1914), No. 3, pp. 22–25*).—Comparison of radiation intensities at Washington, D. C., and Mt. Weather, Va., are reported and briefly discussed, attention being called particularly to the three principal factors which tend to equalize summer and winter intensities, namely, distance from the sun, water vapor in the air, and dust particles. Attention is called to the fact that the warmer temperature of the air in summer is not due so much to solar radiation absorbed as to the greater number of hours of sunshine in summer and the larger amount of terrestrial radiation.

Volcanic dust veils and climatic variations, H. Arctowski (*Ann. N. Y. Acad. Sci., 26 (1915), pp. 149–174, figs. 7; abs. in Nature [London], 96 (1915), No. 2394, p. 80; Sci. Abs., Sect. A—Phys., 18 (1915), No. 11, p. 589*).—"Preliminary investigation on temperature records led to the conclusion that a general rise in the temperature of the atmosphere was probably due to an increase in the solar constant. Further reductions of the curves with special reference to departures from monthly means, and including the epochs of great volcanic eruptions such as Krakatoa (1883) and Katmai (1912), now show that the short-period variations of temperature have nothing in common with the presence or absence of volcanic dust veils."

An article covering substantially the same ground has been noted from another source (E. S. R., 33, p. 806).

Variation in annual rainfall, A. Hazen (*Engin. News, 75 (1916), No. 1, pp. 4, 5. fig. 1*).—The areas having the same coefficient of variation in annual rainfall are shown on a map of the United States, and the value of such information, especially from the engineering standpoint, is briefly discussed. While this map is looked upon as simply a first rough approximation, it serves to give a fairly accurate idea of the general conditions of rainfall variation. It is considered most reliable for the eastern part of the United States. It indicates that the coefficient of variation is lowest on the Atlantic coast, and generally higher on the Pacific coast and in mountainous regions. For example, the coefficient of variation is 0.15 at New York and 0.3 at San Francisco.

Temperature variations, A. Angot (*Compt. Rend. Acad. Agr. France, 1 (1915), No. 28, pp. 789–793*).—From a study of temperature variations at Paris, briefly discussed in this article, the conclusion is drawn that monthly, seasonal, and annual temperature variations in France are entirely fortuitous, and that it is not possible to predict future by means of past variations.

Yields in their relation to weather and the possibility of further increases in them, W. Dir (*Mitt. Deut. Landw. Gesell., 29 (1914), Nos. 29, pp. 421–424; 30, pp. 431–435; abs. in Jahresber. Landw., 29 (1914), pp. 3–5*).—Data are given for yields of various crops and for temperature, rainy days, precipitation, and sunshine at Hadmersleben, Germany, during 1911, 1912, and 1913, and an attempt is made to correlate the weather conditions with the crop yields, espe-

cially as related to critical periods of crop growth. A close relation was found to exist between the yield and the weather, the yield depending largely upon the adaptation or adjustment of the crop to the weather conditions.

The results indicate the great importance of adaptation of season and crop, with reference especially to rainfall, late frost, selection of varieties and seed, rate and time of seeding, use of fertilizers, etc. It is shown that by discrimination in the selection of seed, rate and time of seeding, and use of fertilizers, unfavorable weather conditions can be to a considerable extent overcome or controlled. For example, fertilized crops give better yields in a dry season than unfertilized.

Practical ventilation, C. F. Bennett (*Abs. in Lit. Digest, 50 (1915), No. 11, pp. 544, 545*).—The author in this article condemns the usual "plenum" system of ventilation which seeks to flush out the impurities by introducing large quantities of outside air. He maintains that the better procedure is to keep the pressure in a room slightly below that of the atmosphere instead of above it as in the plenum system, and then remove the relatively small quantity of impure air, admitting just enough outside air to replace this.

The measurement of humidity in air, Tschaplowitz (*Ztschr. Hyg. u. Infektionskrank., 80 (1915), No. 2, pp. 193–218, figs. 2*).—Tests with a number of psychrometers of different styles are reported, and information is given regarding the use of these instruments in recording the humidity of dwelling houses, schoolrooms, etc.

Protection of life and property against lightning, O. S. Peters (*Jour. Wash. Acad. Sci., 5 (1915), No. 19, pp. 625–628*).—This is an abstract of a paper reporting a survey of statistical data relating to life and property hazards from lightning and describing existing methods of protection against lightning.

It is stated that "the property loss by lightning for the entire United States is approximately $8,000,000 per year, of which by far the greater part occurs in rural districts." Approximately 500 persons are killed and 1,000 injured by lightning annually in the United States, about 90 per cent of the casualties occurring in rural districts.

Taking lightning rods as they come in the general run of installations, they reduce the fire hazard from lightning from 80 to 90 per cent in the case of houses and as much as 99 per cent in the case of barns. Of the ordinary metals available for lightning rods, one is about as good as another. Resistance to atmospheric and soil corrosion is the chief essential to be considered. Good mechanical construction is a prime essential to permanency, and the resistance of the earth connection should be made as low as practicable, not exceeding 15 or 20 ohms at any time. Aerial terminals with points should be placed at all chimneys, gables, and other projections. Conductors should be so installed as to furnish two or more widely separated paths to the earth.

The property loss from lightning is not considered sufficient to make universal protection against it a paying investment. It is justified as an investment only when risk to human life is involved or the property risk is great enough to make protection more economical than insurance. A high degree of safety is afforded by a well-rodded building, the next degree of safety is in an unprotected house, and the least in the open or in unprotected outbuildings.

Efficacy of lightning rods, J. W. Smith (*Ohio Nat., 15 (1915), No. 4, pp. 437–442*).—This article briefly summarizes the results of a study of the damage caused by lightning and the efficiency of lightning rods as a protection against lightning, particularly in the north-central States.

It is shown that in this region the damage from this source is considerable. The loss and damage are far greater (75 per cent) in the country than in the

cities. The conclusion is reached that where lightning rods have been correctly installed they have furnished a high degree of protection.

SOILS—FERTILIZERS.

Soil survey of Colquitt County, Georgia, A. T. SWEET and J. B. R. DICKEY (*U. S. Dept. Agr., Advance Sheets Field Operations Bur. Soils, 1914, pp. 39, pls. 2, fig. 1, map 1*).—This survey, made in cooperation with the Georgia State College of Agriculture and issued December 24, 1915, deals with the soils of an area of 348,160 acres in southern Georgia, the topography of which is mainly gently undulating to rolling, with some hilly and broken and some flat, poorly drained areas. The county as a whole is said to be well drained.

"The soils of Colquitt County are of Coastal Plain origin and are almost uniformly sandy in texture at the surface, with a sandy clay subsoil, making them easy to cultivate and retentive of moisture." Including swamp, 22 soil types of 10 series are mapped, of which the Tifton series, including sandy loam, fine sandy loam, and coarse sandy loam, "embraces the most extensive and productive and also the most highly improved sections of the county." The Norfolk sandy loam is the second most extensive type.

Soil survey of Dekalb County, Georgia, D. D. LONG and M. BALDWIN (*U. S. Dept. Agr., Advance Sheets Field Operations Bur. Soils, 1914, pp. 25, fig. 1, map 1*).—This survey, made in cooperation with the Georgia State College of Agriculture and issued December 18, 1915, deals with the soils of an area of 174,080 acres in north-central Georgia, the topography of which is gently rolling to hilly, affording ample drainage.

The soils of the county are of residual and alluvial origin, and belong mainly to the Piedmont Plateau soil province. The alluvial soils cover only a small percentage of the area. In addition to rock outcrop and meadow, 11 soil types of five series are mapped, of which the Cecil soils, including clay loam, sandy loam, gravelly loam, stony clay loam, and fine sandy loam are much the most important and extensive.

Soil survey of Jackson County, Georgia, D. D. LONG and M. BALDWIN (*U. S. Dept. Agr., Advance Sheets Field Operations Bur. Soils, 1914, pp. 27, fig. 1, map 1*).—This survey, made in cooperation with the Georgia State College of Agriculture and issued October 18, 1915, deals with the soils of an area of 221,440 acres in northeastern Georgia. Jackson County is situated in the heart of the Piedmont section of the States and consists of a rolling plain or plateau, the divides of which are "generally smooth, undulating, or gently rolling, with a gentle slope on each side toward the stream courses, the surface becoming steeper and more irregular as the stream valleys are approached." The entire county is well drained.

The soils are of residual and alluvial origin. Seven soil types of four series and two miscellaneous types are mapped in the county. The Cecil soils cover 88.6 per cent of the county, the Cecil clay loam being the most widely developed type.

The soils and agricultural development of the Hudson Valley, E. O. FIPPIN (*Cornell Countryman, 13 (1915), No. 1, pp. 23–27, figs. 2*).—This article deals with the general characteristics, fertility requirements, and crop adaptabilities of an area of about 6,200 square miles comprising parts of 13 counties in southeastern New York. The topography of the southern part is mountainous and of the remainder rolling to hilly. With reference to origin, the soils are divided into first bottom, swamp, terrace, lake, and glacial soils, and nonagricultural types consisting of rough stony land and rock outcrop. The glacial soils, including the Gloucester, Dutchess, Dover, and Cossayuna series, are said to cover

about 55.5 per cent of the area. It is stated that as a whole the soils are not of high fertility and need drainage, lime, organic matter, and good tillage.

Soil survey of Bladen County, North Carolina, R. B. Hardison, R. T. Allen, B. B. Derrick, L. L. Brinkley, S. O. Perkins, and R. C. Jurney (*U. S. Dept. Agr., Advance Sheets Field Operations Bur. Soils, 1914, pp. 35, fig. 1, map 1*).—This survey, made in cooperation with the North Carolina Department of Agriculture and issued October 14, 1915, deals with the soils of an area of 542,080 acres in southeastern North Carolina, the topography of which ranges from level to undulating and gently rolling. "All portions of Bladen County are well watered, but the region is not adequately drained, so that one of the main problems is the reclamation of swampy areas.

"Bladen County lies wholly within the Coastal Plain Province, and the soils have been derived from unconsolidated sands and clays, and locally from heavy clays of sedimentary origin." Twenty-two soil types of twelve series are mapped, of which the Norfolk types, including sand, fine sandy loam, sandy loam, fine sand, and very fine sandy loam, are the most extensive and important. The Portsmouth sand is the most extensive single type. It is stated that the soils are usually deficient in organic matter.

Soil survey of Chesterfield County, South Carolina, W. J. Latimer, M. W. Beck, J. M. Snyder, L. Cantrell, and N. M. Kirk (*U. S. Dept. Agr., Advance Sheets Field Operations Bur. Soils, 1914, pp. 45, pl. 1, fig. 1, map 1*).—This survey, issued December 23, 1915, deals with the soils of an area of 510,720 acres in northeastern South Carolina, comprising parts of the Piedmont and Coastal Plain provinces, the topography of which is rolling to hilly, with a few level areas. The surface drainage is generally well established.

"The soils of Chesterfield County fall into four general groups—upland soils derived from beds of unconsolidated sands and clays, upland soils derived from slates and granites, first-bottom overflow land, and terrace or old alluvium. The first covers about 60 per cent of the county, the second about 25 per cent, the third about 10 per cent, and the fourth about 5 per cent." Including 5 miscellaneous types, 32 soil types of 19 series are mapped, of which the Norfolk sand and sandy loam are the predominating types. "The sandy soils which have been cultivated for some time and the unimproved heavy soils are in need of organic matter. . . . A very small part of the county is in need of artificial drainage. . . . Erosion is active in some of the more rolling or hilly areas, resulting in serious damage."

Soils of western Washington, E. B. Stookey (*Washington Sta., West. Wash. Sta., Mo. Bul., 3 (1915), No. 8, pp. 10–15*).—The general characteristics of the soils of western Washington are briefly discussed, it being pointed out that about half of the soils are of glacial origin, over a third of residual origin, and the remainder of lake and wind-laid, alluvial fan, coastal plain, river-flood plain, and muck and peat origin.

Soil survey of Dane County, Wisconsin, W. J. Geib, A. E. Taylor, and G. Conrey (*U. S. Dept. Agr., Advance Sheets Field Operations Bur. Soils, 1913, pp. 78, fig. 1, map 1*).—This survey, made in cooperation with the Wisconsin Geological and Natural History Survey and issued December 20, 1915, deals with the soils of an area of 769,280 acres in southern Wisconsin, the surface of which varies from level or gently undulating prairies and outwash plains to hilly and broken country. The western part of the county is driftless and the configuration is largely the result of erosion. The remainder of the county has been greatly influenced by glacial action.

The soils of over half the county are derived from the débris of the last Wisconsin glaciation and of a very small part from the pre-Wisconsin glaciation. "In addition to these sources of material a mantle of loess has been deposited

over most of the unglaciated section and over a part of the glaciated section." Including 5 miscellaneous types, 31 soil types of 14 series are mapped, of which the Miami, Carrington, and Union silt loams are, in their order, the most extensive.

How great is the surface of a gram of surface soil? II, P. EHRENBERG (*Fühling's Landw. Ztg., 64 (1915), No. 9–10, pp. 233–243*).—In a further contribution to the subject the author reviews data to strengthen his previous conclusions (E. S. R., 33, p. 216). He introduces further data from tests of siliceous gels which show that the so-called hygroscopic water of colloidal gels in soils consists not only of the films covering the surfaces but of the water held by capillarity between these films in the spongy structure of the gel. On this basis it is concluded that the surface of a soil containing an appreciable amount of colloidal matter is not proportional to the hygroscopic water.

A new method of measuring the concentration of the soil solution around the soil particles, G. BOUYOUCOS and M. M. McCOOL (*Science, n. ser., 42 (1915), No. 1084, pp. 507, 508*).—In experiments with sand, loam, clay, and peat with varying moisture contents to test the freezing point method as a measure for the concentration of the soil solution, it was found that the lowering of the freezing point and consequently the concentration of the soil solution varied directly with the amount of water present. When the soils contained a high moisture content the lowering of the freezing point was rather small and did not vary greatly between the different soils, but when the moisture content of the same soils was reduced considerably the lowering of the freezing point was increased, in some cases very greatly.

In further experiments to ascertain the sensitiveness of the method to detect differences in concentration in the soil solution and to see whether the concentration of the soil solution can be increased by the addition of mineral salts, the freezing point of a complete nutrient stock solution in concentrations of 80, 2,000, and 4,000 parts per million was determined alone and in contact with the different soils. It was found that the lowering of the freezing point of the solutions in contact with the soils did not vary greatly from that of the solution alone.

Soil acidity and methods for its detection, E. TRUOG (*Science, n. ser., 42 (1915), No. 1084, pp. 505–507*).—The author disagrees with the conclusions drawn by Harris (E. S. R., 32, p. 30) regarding the cause of soil acidity, and points out that the basis of the colloid theory of soil acidity, namely, that "the relative affinity of the acids is independent of the nature of the base," holds only when all the reacting substances are in a true solution, "or if there are partially soluble substances formed, then in any series of comparisons the solubility of the corresponding substances must be of the same order. The opportunity for secondary or side reactions must also be eliminated or made comparable."

In order to overcome these difficulties small amounts of very finely powdered soil were thoroughly shaken with comparatively large amounts of salt solutions for a short period, then quickly filtered and the acidity of the filtrate determined. It was found that the soil took up very nearly equivalent amounts of different bases from salts having a common acid ion. "The results of these experiments point strongly to the existence of true acid substances as the cause of soil acidity."

Soil temperature, an important factor in scientific agriculture, L. B. PRITCHARD (*Jour. Dept. Agr. Victoria, 13 (1915), No. 7, pp. 399–405, figs. 3*).—The influence of soil temperature on the physical, chemical, and biological properties of soil is briefly discussed, and the results of observations carried out at the Central Research Station at Werribee, Australia, on the diurnal

variations in soil temperature at depths of 1, 6, 12, and 24 in. from the surface are graphically reported.

These results show that at the 1-in. depth the soil is exposed to wide ranges of temperature and that as the depth increases the temperature variations decrease in amplitude. At the 24-in. depth the daily variations are practically negligible. "Each curve cuts each other curve at least twice during the year. For a certain period the upper layer of soil is giving and for the remainder of the year is receiving heat from the layer above or below. In the warm months of the year the 1-in. curve occupies a position above the other curves, but during the cold period the positions are entirely reversed. . . . The increase of temperature from spring to summer is more rapid than the decrease from autumn to winter."

From observations on transpiration and evaporation by wheat, oats, barley, and alfalfa grown under soil temperature conditions comparatively identical with those of the above experiments, it is inferred that "vegetative growth as far as the Werribee soil was concerned was never at a standstill at any period of the year."

Influence of growth of cowpeas upon some physical, chemical, and biological properties of soil, C. A. LeClair (*U. S. Dept. Agr., Jour. Agr. Research, 5 (1915), No. 10, pp. 439–448, pl. 1, figs. 2*).—A historical summary of work bearing on the subject is given and experiments conducted at the Missouri Experiment Station with a silt loam soil are reported, the main purpose of which was to study the influence of the growth of cowpeas on the soil compactness and its nitrate content.

"The data given show conclusively that cowpeas tend to maintain the friability of loose and compact seed beds. . . . While cowpeas take more water from the soil than evaporates from uncultivated adjacent lands, the removal of water is from below the second foot of soil. Land that was plowed and left uncultivated or plowed and seeded to cowpeas contained a greater quantity of nitrates in the soil at the end of the season than unplowed land similarly treated. The bacterial activities of the soil upon which cowpeas were grown tended to show that the soil organisms are probably a factor in preventing the packing of soil as also is the mechanical shade effect of the crop grown upon the land."

Oxidation of organic matter in the soil, G. S. Fraps (*Texas Sta. Bul. 181 (1915), pp. 5–27*).—Laboratory experiments with 25 soils, varying in texture from fine sand through sand, fine sandy loam, and clay loam to clay, are reported, the purpose of which was to study the oxidation of natural organic matter in soil and of different kinds of added organic matter in soil by means of the loss on ignition and of the carbon dioxid produced; and the influence of the quantity of water in the soil, the method of adding it and of calcium carbonate on carbon dioxid production.

It was found that the oxidation of organic matter as measured by the loss on ignition of the soil was rapid during the first three weeks, after which the loss on ignition was irregular. "Corn chop, rice hulls, wheat shorts, and wheat bran were oxidized 72 to 81 per cent in 81 weeks, as measured by loss on ignition. Meat tankage and blood were oxidized 47 to 68 per cent. Excrement and bat guano were oxidized 15 to 22 per cent."

On the basis of carbon dioxid production "cotton-seed meal was rapidly oxidized, about 10 per cent in one day, and nearly 30 per cent in four days. In another experiment, 38.8 per cent of the carbon of cotton-seed meal, 10.1 per cent of the manure, and 8.8 per cent of the corncobs were oxidized in the first week. Oxidation decreased rapidly after the first week. With cotton-seed meal, the oxidation of each succeeding week was about one-half of the preceding

week, until during the fourth week the oxidation became so slow as hardly to be distinguished from the soil carbon. The decrease in oxidation of excrement was less rapid, but still marked. Humic acid was very resistant toward the oxidation processes. The relative powers of soils to oxidize excrement (oxidation capacity) . . . varied comparatively little with most of the soils, but was low with three of 17 soils. There are decided differences in the oxidation of the soil carbon in the different soils. The relative oxidation of the soils tested (based on equal nitrogen) was 130 for three soils containing less than 0.04 per cent nitrogen, compared with 81 for six soils containing 0.05 to 0.099 per cent nitrogen, and 42 for six soils containing over 0.1 per cent nitrogen. The soils containing the least nitrogen appear to carry their carbon in a more easily oxidized condition. Soils when almost dry oxidized organic matter rapidly. Oxidation in a saturated soil depends upon the character of the soil and the way in which the water is added. The oxidation may be very low or moderate, Carbonate of lime had little or no effect upon oxidation in the soil tested."

Effect of additions on availability of soil phosphates, G. S. Fraps (*Texas Sta. Bul. 178* (*1915*), *pp. 15*).—Pot experiments with six soils, including fine sandy loam, fine sand, and clay, to determine the effect of additions of precipitated calcium carbonate and of organic matter as ground corncobs, sawdust, and starch on the assimilation of the soil phosphates by corn, millet, mustard, and Kafir corn are reported.

It was found that when nitrogen and potash were supplied, as nitrates of soda and ammonium and sulphate of potash the addition of calcium carbonate at the rate of 5 tons per acre increased the size of the crop and the amount of phosphoric acid withdrawn from the soil phosphates on the six soils tested. The effect of the lime was small at first, but usually increased with succeeding crops. The addition of starch, sawdust, or cobs had some effect on the crop in two soils, but little with the other four soils. "With the six soils which gave up phosphoric acid equal to 5 to 18 bu. of corn per acre per crop, the addition of carbonate of lime caused an increase in the quantity of phosphoric acid taken up equal to 3 to 7 bu. per acre per crop. The vegetable matter in three cases caused a gain in phosphoric acid taken up equal to 2 or 3 bu. corn per acre. The presence of carbonate of lime or of vegetable matter may bring about differences in the quantity of phosphoric acid assimilated by plants from soils, containing equal quantities of active phosphoric acid. No relation can be traced between the additions and the phosphoric acid content of the crops. When the crops are unusually small, the phosphoric acid content usually runs higher than the average."

The additions of calcium carbonate and organic matter and the phosphoric acid removed by the crops had practically no effect upon the quantity of active phosphoric acid remaining in the soil at the end of the experiments. "The phosphoric acid taken up by the plants was evidently drawn largely from the more insoluble phosphates."

Fate and effect of arsenic applied as a spray for weeds, W. T. McGeorge (*U. S. Dept. Agr., Jour. Agr. Research, 5* (*1915*), *No. 11, pp. 459–463*).—Continuing work previously noted (E. S. R., 33, p. 623), studies were made at the Hawaii Experiment Station to determine the fate of sodium arsenite when applied to ferruginous red and brown clays and to a highly organic silt soil as a spray for weeds.

It was found that the fixation of the arsenic in the surface soil involves chemical reactions consisting of "a replacement or solution of iron, calcium, magnesium, and humus, owing in part to a hydrolysis of the sodium arsenite in solution, also a combination with the dibasic and tribasic elements to form the difficultly soluble arsenites or arsenates."

Activity of soil protozoa, G. P. KOCH (*U. S. Dept. Agr., Jour. Agr. Research, 5 (1915), No. 11, pp. 477–488*).—Experiments with field and greenhouse soils conducted at the New Jersey Experiment Stations are reported, the purpose of which was to study (1) protozoan activity in soils of different moisture content and under constant and variable temperatures, (2) the effect of moisture on the activity of soil protozoa under constant and variable temperatures, and (3) the period of excystment of soil protozoa. It was found that direct examination of the soil to which a little water was added was the most satisfactory methd of determining the presence of motile protozoa.

It was found that "under ordinary greenhouse conditions small ciliates, flagellates, and amebæ are active in some soils, but their presence is very limited. Active protozoa (small ciliates, large ciliates, flagellates, and amebæ) do not seem to be present in field soils with a normal moisture content and even when the moisture content is slightly supernormal. . . .

All field soils contain cysts of protozoa the organisms of which become active when conditions become favorable. The moisture content of the soil is the primary influencing factor which determines the presence or absence of the active protozoa in the soil, while the temperature, the presence of organic matter, and the physical properties of the soil are secondary factors. Soon after standing water is accumulated, as after a heavy rain, some protozoa will excyst and be active as long as the moisture content is favorable. Active protozoa seem to be always present in free standing soil water [and] in water-logged soils at constant and variable temperatures. Under normal conditions it would seem that protozoa can not excyst in 2 minutes. Small ciliates can excyst in 1 to 2 hours at 22 to 24° C. At the same temperature flagellates can excyst in 6 to 8 hours and large ciliates can excyst in 40 hours."

A list of references to cited lateraturе is appended.

Azotobacter and nitrogen fixation in Indian soils, J. H. WALTON (*Mem. Dept. Agr. India, Bact. Ser., 1 (1915), No. 4, pp. 97–112, pls. 5, figs. 2*).—Preliminary studies on the optimum conditions for nitrogen fixation by Azotobacter in Indian soils are reported.

Using Ashby's nutrient solution (E. S. R., 18, p. 721) it was found that with Pusa field soil the best length of incubation period for nitrogen fixation by Azotobacter was from 10 to 14 days. A higher nitrogen fixation per gram of mannite was obtained with 10 gm. of mannite per liter of solution than with 12 or 20 gm. The addition of basic slag did not influence nitrogen fixation. The addition of ferric chlorid or ammonium sulphate depressed fixation, while the substitution of magnesium carbonate for calcium carbonate only slightly increased it.

With Pusa soil nitrogen fixation was lowest between October and January and highest between June and September. Low fixation coincided with the drying of the soil and lowering of the temperature, while high fixation accompanied abundant moisture and fairly high temperature.

In 11 out of 17 cases nitrogen fixation in liquid cultures was greater at 30 than at 20° C. In soil cultures nitrogen fixation was increased by cultivation and the addition of suitable carbohydrate material. Pure cultures of Azotobacter isolated from different Indian soils varied in nitrogen-fixing power and in morphological and cultural characters, the latter being constant in any particular variety.

Additions of basic slag, filter paper, sterilized soil, and humus to pure cultures of Azotobacter were all beneficial to nitrogen fixation, but additions of different nitrogenous substances had little effect.

It is concluded from these results that proper soil management should include the provision of conditions favorable to the physiological activity of

Azotobacter, namely, aeration, the presence of lime and of available carbohydrates, and the maintenance of the supply of organic matter.

The nitrogen cycle in nature, K. Kaiser (*Gartenflora, 64 (1915), Nos. 5–6, pp. 73–85, figs. 3; 7–8, pp. 113–123, figs. 2*).—This article discusses the nitrogen cycle in its relation to the physiology of plants and animals; the history of and the processes involved in the Chile nitrate, ammonium sulphate, and other nitrogen fertilizer industries; and the processes of nitrogen fixation, nitrification, and denitrification in soil.

The manurial value of natural (dried) and of degreased sewage sludge, J. A. Voelcker (*Rpt. Comrs. Treating and Disposing of Sewage [Gt. Brit.], 9 (1915), pp. 156, 157; abs. in Jour. Bd. Agr. [London], 22 (1915), No. 3, pp. 235–238*).—Pot experiments are reported with wheat on a light sandy loam soil deficient in lime to determine the fertilizing value of sewage sludges, obtained from seven different processes, when in the natural (dried) state and when the grease had been extracted.

Analyses of one sample each of the natural and degreased sludges showed that they contained, respectively, 2.49 and 3.02 per cent lime, 0.69 and 0.64 per cent phosphoric acid, 2.01 and 1.77 per cent total nitrogen, and 7.58 and 1.96 per cent ether extract. The sludges were added at the rates of 1 and 2 tons per acre and 1 ton per acre supplemented by ½ ton of lime.

Both types of sludge produced an increase in the yield of wheat, the gain being more marked in the grain than in the straw. "The best results were obtained by the use of sludge, whether natural or degreased, along with lime. . . . One ton per acre of the natural sludge used alone did considerably better than a corresponding 1 ton of the degreased, but between the 2 tons per acre application of each the difference was small, the 1 ton per acre of natural sludge along with lime doing, however, rather better than a similar application of degreased sludge with lime. . . . There would appear, therefore, to be no advantage, from a manurial point of view, but rather the reverse, in the degreasing process."

Comparative field trials with dried and degreased sewage sludges at Rothamsted, E. J. Russell and E. H. Richards (*Rpt. Comrs. Treating and Disposing of Sewage [Gt. Brit.], 9 (1915), pp. 158, 159; abs. in Jour. Bd. Agr. [London], 22 (1915), No. 3, pp. 235–238*).—Field experiments with grass and oats on a heavy loam soil to determine the fertilizing value of dried and degreased sewage sludges are reported.

Analyses of one sample each of the dried and the degreased sludges showed that they contained, respectively, 1.53 and 1.55 per cent nitrogen, 0.85 and 1.33 per cent phosphoric acid, and 8.55 and 1.57 per cent ether extract.

The results of the experiments showed that neither of the sludges gave any marked return or possessed any manurial value when used alone in quantities up to ½ ton per acre. It is concluded that the nitrogen in sewage sludge is in a very stable combination which does not decompose readily under natural soil conditions, and that the removal of fat does not increase the ease of decomposition.

The Dickson centrifuge system of sewage treatment, E. H. Tripp (*Jour. Soc. Chem. Indus., 34 (1915), No. 10, pp. 517–524, figs. 7*).—In connection with a discussion of a process consisting mainly of treating sewage with live brewers' yeast, it is shown that the resulting sludge contains less water and more organic matter and total nitrogen than ordinary septic tank sludge and a relatively high content of nitrogen available to plants.

Analyses of two samples of the dried sludge showed that they contained, respectively, 46.79 and 47.85 per cent organic and volatile matter, 28.13 and

23.03 per cent sand and matter insoluble in hydrochloric acid, 2.64 and 4.04 per cent phosphoric acid, 4.87 and 11.1 per cent lime, 2.51 and 2.26 per cent organic nitrogen, and 3.05 and 2.74 per cent ammonia nitrogen. The first sample contained 0.26 per cent potash.

In sand culture experiments with wheat to determine the value of the organic matter in the sludge, in which the different soluble constituents of the sludge were separated and used in solutions to water the wheat plants, it was found that the aqueous extract of the dried sludge fertilizer had a very marked beneficial action upon plant development, and that the soluble organic constituents produced an effect equal in intensity to that of the dried sludge itself. Similar experiments with septic tank sludge gave the same results. "The amount of soluble matter in the Dickson fertilizer (without additions) was, however, found to be about double that in the specimen of tank sludge investigated. The precipitated organic matter from the latter was also relatively smaller in amount, had a most unpleasant smell, and was of a darker color."

The utilization of town sewage for the manufacture of ammonium sulphate, A. A. Kaluzhskiĭ (*Iz Rezul't. Vegct. Opytov Lab. Rabot, 9 (1913), pp. 253–358, pls. 7, figs. 2*).—Laboratory experiments with municipal sewage to determine its value as a source of ammonium sulphate are reported.

Ammonia was obtained by treatment of the whole sewage with calcium hydroxid and boiling or steaming. The greatest quantity of nitrogen was present as volatile ammonia (43.7 per cent), followed in order by the nitrogen of organic compounds of the sludge and the nitrogen combined in the liquid sewage. The remaining quantities of nitrogen were about equally distributed between the combined and uncombined ammonia of the sludge and the organic compounds dissolved in the liquid sewage.

There was no important loss of nitrogen from the sewage when kept air-tight for three months. When kept in open tanks nitrogen losses were observed after four days, which steadily increased to 67.76 per cent after three months.

It was found by a series of distillation experiments that on the average about 9.66 kg. of ammonium sulphate could be prepared from 1 cubic meter of the whole sewage. Of the total nitrogen extracted by lime more than half (58.4 per cent) was volatile ammonia, 36.29 per cent was combined ammonia, and the remaining quantity (5.31 per cent) was obtained from organic compounds. Progressive extraction of the ammonia gave larger amounts than immediate total extraction. The different heating methods used exercised no marked influence on the amounts of ammonia extracted. While the speed of the ammonia extraction differed widely for the different methods of heating used, the general character of the processes was the same.

On distillation with calcium oxid the ammonia separation began immediately, although in small amounts. The separation of volatile ammonia before the addition of lime was observed only after heating to the boiling point. For a maximum extraction of ammonia from the liquid from 10 to 12.5 gm. of lime per liter of liquid was necessary by the immediate total extraction method, while by progressive extraction only 5 gm. of lime was needed. One cubic meter of the sewage after extraction of ammonia with calcium hydroxid yielded 33 kg. of sludge which contained 1.5 per cent nitrogen, from 2 to 3 per cent phosphoric acid, and approximately 30 per cent calcium oxid.

On the basis of the results obtained it is concluded that the manufacture of ammonium sulphate from municipal sewage of similar composition is economically profitable.

The phosphate deposits of Florida, G. C. Matson (*U. S. Geol. Survey Bul. 604 (1915), pp. 101, pls. 17, figs. 2*).—This report deals with the geology, mineralogy, origin, composition, and mining of the phosphate deposits of Florida.

It is stated that these deposits consist of mineral earthy phosphorites whose physical characteristics vary, depending roughly on the relative proportion of calcium phosphate and impurities. The phosphates are of three distinct types, namely, rock phosphate, pebble phosphate, and soft phosphate which occurs in fine powder or in soft masses. These phosphates occur in sedimentary rocks and, with the exception of certain deposits southwest of Lakeland, are of secondary origin, having been redeposited either by mechanical or chemical action. It is stated that phosphate appears to be very widely distributed in the northern and central parts of the peninsula and deposits are found on the west side of Apalachicola River in western Florida. The workable areas are, however, confined to certain parts of the peninsula.

Analyses of the different types of phosphate are reported, which indicate that the average content of tricalcium phosphate in land pebble phosphate ranges from about 65 to 75 per cent and in river pebble phosphate from 55 to 65 per cent. Composite samples of rock phosphate showed in one case over 82 per cent tricalcium phosphate and in other cases contents of tricalcium phosphate varying from 75.3 up to 81.06 per cent.

A bibliography of works on Florida phosphates is appended.

Potash from wood and plant ashes, H. BRADLEY (*Metallurg. and Chem. Engin., 13 (1915), No. 14, pp. 841–846, fig. 1*).—This article deals with the history of potash production from wood ashes, with the different uses of potash, and with the process of manufacturing potash from wood ashes and possible improvements therein. The characteristics of potash from wood ashes and its practical utilization are also discussed. Tables of analyses of potashes from wood and of various woods and their ashes are included.

Potash in certain copper and gold ores, compiled by B. S. BUTLER (*U. S. Geol. Survey Bul. 620–J (1915), pp. 227–236*).—This paper contains portions of complete analyses of copper and gold ores from different districts which show that the potash content is in most cases relatively high.

Experiments on potash extraction from muscovite, by G. Steiger, are also reported which show that the muscovite used contained 9.55 per cent of potash. "Of this amount practically the whole was found in the leach water, showing that by first fusing the muscovite and then treating it with ammonium chlorid its potassium was entirely converted into the soluble form. The results show that more than 25 per cent of the potassium present may be converted into the soluble form by the treatment with ammonium chlorid alone." It was also found that "by a very superficial treatment with hydrochloric acid approximately one-third of the potassium may be extracted."

Evaporation of potash brines, W. B. HICKS (*U. S. Geol. Survey, Prof. Paper 95–E (1915), pp. 65–72, figs. 3*).—In evaporation studies on artificial potash brines, the purpose of which was to throw light on the conditions governing the deposition of potash salts from solution, it was found that the potassium was concentrated best in brines containing carbonates and chlorids and poorest in those containing sulphates and carbonates, although a small amount of sulphate apparently did not hinder the concentration materially.

"In brines that contain several acid radicles the concentration of potassium may increase to a maximum as evaporation proceeds and then decline. The evidence at hand indicates that a large percentage of the potassium in a solution is lost during evaporation before the maximum concentration of potassium is attained. The loss is small until the potassium reaches a concentration of about 4 per cent, but it is very rapid during further evaporation. Therefore, in the commercial extraction of potash from brines, especially those of the alkalis, it would seem best first to concentrate the solution by evaporation until

it contained about 4 per cent of potassium and then to subject the resulting bittern to other processes of manufacture. The most advantageous point of concentration would, however, have to be determined for each particular brine."

Lime and its uses in agriculture, D. A. GILCHRIST (*Armstrong Col., Newcastle-upon-Tyne, Agr. Dept. Bul. 12 (1915), pp. 24*).—This bulletin discusses the use of ground lime, ground limestone, gas lime, chalk, and lime mud in agriculture and reviews different experiments by others showing the effect of liming on different crops.

Agricultural lime analyses (*Md. Agr. Col. Quart., No. 68 (1915), pp. 11*).—This pamphlet contains actual and guarantied analyses of agricultural limes offered for sale in Maryland from June, 1914, to May, 1915, and the text of the Maryland lime inspection law.

Fertilizer analyses (*Md. Agr. Col. Quart., No. 67 (1915), pp. 32*).—This bulletin contains actual and guarantied analyses and comparative valuations of 629 samples of fertilizers and fertilizing materials offered for sale in Maryland from August, 1914, to January, 1915. A note on home mixing of fertilizers is also included.

Fertilizer analyses (*Md. Agr. Col. Quart., No. 69 (1915), pp. 35*).—This pamphlet contains actual and guarantied analyses and comparative valuations of 809 samples of fertilizers and fertilizing materials made at the college from February to July, 1915.

Analyses of fertilizers. Analyses of cotton-seed meal, B. W. KILGORE ET AL. (*Bul. N. C. Dept. Agr., 35 (1914), No. 11, pp. 120*).—This bulletin contains analyses and valuations of 1,981 samples of fertilizers and fertilizing materials collected under the North Carolina fertilizer inspection law during the fall season of 1913 and the spring season of 1914, and analyses of 165 samples of cotton-seed meal.

Analyses of commercial fertilizers, P. H. WESSELS ET AL. (*Rhode Island Sta. Insp. Bul., 1915, Oct., pp. 12*).—This bulletin contains actual, and in some cases guarantied, analyses with valuations of 78 samples of fertilizers and fertilizing materials (including lime and plaster) collected in Rhode Island in 1915, and representing a part of the fertilizer inspection for the year.

The international movement of fertilizers and chemical products useful to agriculture (*Internat. Inst. Agr. Rome, Bul. Agr. and Com. Statis., 6 (1915), No. 9, pp. 499–532*).—This review, issued in September, 1915, is the third of a series (E. S. R., 33, p. 626) and gives figures for the fertilizer production and trade for 1913, 1914, and the first half of 1915. Data are also given for imports and exports of sulphur for the different countries and for the production of copper sulphate in Europe and North America. No figures are given relating to the production of potash salts in Germany.

A bibliography of 305 references to recent literature on the subject of fertilizers is appended.

AGRICULTURAL BOTANY.

Respiration experiments with sweet potatoes, H. HASSELBRING and L. A. HAWKINS (*U. S. Dept. Agr., Jour. Agr. Research, 5 (1915), No. 12, pp. 509–517*).—The experiments described were conducted to ascertain whether any correlation exists between the seasonal changes in the sugar content of sweet potatoes and their respiratory activity and also whether the monosaccharids or the disaccharids furnish the chief material for respiration. The experiments were carried on at a temperature of 30° C. (86° F.), that temperature having been chosen owing to the fact that it is essentially the temperature used in curing sweet potatoes for storage.

From the results obtained, there does not appear to be any general correlation between the total sugar content of the sweet potato and its respiratory activity. A simultaneous decrease in the reducing-sugar content and the respiratory activity in given lots of roots is said to indicate a correlation between reducing sugar content and respiration, but seasonal changes and environmental conditions to which the sweet potatoes have been previously subjected are believed to tend to obscure any such correlation in different lots. Experiments with wounded roots indicated that the sugar content was not the limiting factor in the respiration of the sweet potato. The reducing sugars are said to be the immediate source of respiratory material. Cane sugar was found to be relatively stable in the sweet potato, and when once formed, it did not appear to be readily utilized in the process of respiration, while starch and other carbohydrates are present in abundance.

Studies on chicory, V. GRAFE (*Biochem. Ztschr., 68 (1915), No. 1–2, pp. 1–22, fig. 1; abs. in Jour. Chem. Soc. [London], 108 (1915), No. 630, I, p. 200*).—The author has followed up work done in connection with Vouk as previously reported (E. S. R., 31, p. 224), and claimed to have thrown new light on the analogies between starch and inulin, with studies on the metabolism of inulin by plants.

It was found that a high percentage of water in the soil in which chicory is grown lowers the inulin content. This is, on the other hand, somewhat heightened by extreme dryness of the soil.

Investigations on the nature of the bitter principle of chicory gave no absolutely pure product, but evidence was obtained to the effect that this principle is essentially neither alkaloid nor tannin, but a glucosid, the character and relations of which are discussed. The empyreumatic oil given up by chicory appears to be analogous to that of coffee, but of different constitution.

Study of the plantlets shows a certain parallelism between the intake of mineral substances and the formation of organic compounds. It is thought possible that lime and magnesia play a certain part in the condensation processes in the plant.

The physiological value of the reserve in chestnut seeds, C. MANICARDI (*Staz. Sper. Agr. Ital., 47 (1914), No. 8, pp. 633–636*).—In a preliminary note on a study of chestnut seeds and seedlings the author states that the amount of reserve material present in such seeds is always strongly in excess of the requirement of normal germination. The action of this reserve in germination is limited to the development of the root, but the plantlet is able to live for a certain length of time by means of photosynthetic assimilation alone.

Translocation of mineral constituents of seeds and tubers of certain plants during growth, G. D. BUCKNER (*U. S. Dept. Agr., Jour. Agr. Research, 5 (1915), No. 11, pp. 449–458*).—The results of an investigation on the translocation of the mineral matter contained in the seeds and tubers of garden beans, corn, and potatoes are given, the experiments having been carried on at the Kentucky Experiment Station. So far as the present account is concerned, the translocation of phosphorus, calcium, potassium, magnesium, and silicon is reported upon.

The results obtained show that during the growth of the seedlings there is considerable retention of mineral matter, varying from 46.66 per cent in the garden bean and 38.66 in corn to 50.33 in the potato tuber. There were no striking differences observed in the quantities of the several mineral constituents translocated, and no marked selective influence was shown by the roots, stems, or leaves of the growing plants for any particular mineral reserve material contained in the seed or tuber.

Variations in mineral composition of sap, leaves, and stems of the wild grapevine and sugar maple tree, O. M. SHEDD (*U. S. Dept. Agr., Jour. Agr. Research, 5 (1915), No. 12, pp. 529–542*).—In continuation of previous investigations (E. S. R., 27, p. 801), the author has made further observations at the Kentucky Experiment Station on the mineral content of the sap of the wild grapevine (*Vitis cordifolia*) and of two species of maple (*Acer saccharum* and *A. saccharinum*). These experiments were conducted during three years to determine whether the mineral composition of the sap varied at the same time in different parts of the plant, whether it varied during a single season at a certain point, and whether it varied during different years.

There was found to be considerable variation in the composition of the sap when collected at the same time from different points, and great variation when collected from the same point on the vine at different times during the same season. The widest variation in the sap composition was found when it was collected from the same point on the main branches of the vine at the beginning of the sap flow during four successive years. Considerable variation was observed to occur daily in the composition of the sap, the mineral constituents being generally higher during the day, while the sap had a more uniform composition during the night. Young leaves and stems of the grapevine were found to vary considerably during different years and also in the same season.

The observations on the maple trees showed the sap to vary widely in composition when collected at the same point on the tree during two successive years just after the sap flow had begun. The mineral composition of the two species of maple was found to be quite different. It is thought that differences in the composition of the sap can not be entirely explained as being due to a dilution from the water in the soil, and it is believed that the variable mineral composition influences the structure of the growing parts and explains the differences in composition of the same and different varieties of plants.

Boron—its absorption and distribution in plants and its effect on growth, F. C. COOK (*Abs. in Science, n. ser., 42 (1915), No. 1096, pp. 951, 952*).—On account of the use of boron as a larvicide, experiments were conducted to determine its effect on plant growth.

This element is found to be readily absorbed by plants, and the addition of lime to manure which had been treated with borax had no definite effect on the absorption of boron. Potatoes, string beans, soy beans, and cowpeas showed a more equal distribution of boron in the roots, tops, and fruit than was the case with wheat, beets, tomatoes, radishes, and lettuce plants. In some cases, very little boron was found in the roots or fruit, while a considerable amount was found in the rest of the plant. All control plants contained at least a trace of boron. If sufficient boron was added to the soil, a yellowing of the leaves took place, but this was not considered to indicate that the yield would necessarily be affected. Leguminous plants were found more sentitive to boron than any other plants tested.

Plant enzyms.—III, Pathological alterations in the amylase of potatoes, G. DOBY and J. BODNÁR (*Biochem. Ztschr., 68 (1915), No. 3–4, pp. 191–205; abs. in Jour. Chem. Soc. [London], 108 (1915), No. 630, I, p. 202*).—In connection with work previously reported (E. S. R., 28, p. 150), the author has studied the changes in amylase concentration during the resting period of the potato tubers, the changes in activity of the expressed sap, and the relation of amylase concentration to potato variety and region where grown and to the health of the tubers. The results are tabulated for each phase of the work.

It appears that in juices of healthy plants the amyloclastic activity is greater than in those from plants showing the presence of curly leaf disease.

The toxicity of saccharin, E. VERSCHAFFELT (*Pharm. Weekbl., 52 (1915), No. 2, pp. 37–46; abs. in Jour. Chem. Soc.* [*London*], *108 (1915), No. 629, I, p. 111*).—The studies here described, showing the toxic action of saccharin on plants, suggest a general injurious influence on protoplasm, and hence on the human organism.

The effect of alkali on permeability, W. J. V. OSTERHOUT (*Jour. Biol. Chem., 19 (1914), No. 3, pp. 335–343, figs. 5*).—Experiments by the author making determinations on the electrical resistance of living tissues of *Laminaria saccharina* are claimed to show that the permeability of the protoplasm (which is claimed to be accurately measured by the method employed) is considerably increased by the presence of a small proportion of sodium hydrate.

The effect of acid on permeability, W. J. V. OSTERHOUT (*Jour. Biol. Chem., 19 (1914), No. 4, pp. 493–501, figs. 5; abs. in Jour. Chem. Soc.* [*London*], *108 (1915), No. 629, I, p. 109*).—Employing essentially the same method used in the work above noted, in order to test the behavior in this connection by hydrochloric acid, the author found that this acid produces at first a rapid decrease in permeability. This is quickly followed by a rapid increase, the latter continuing until the death point of the plant is reached.

Antagonism between acids and salts, W. J. V. OSTERHOUT (*Jour. Biol. Chem., 19 (1914), No. 4, pp. 517–520, fig. 1; abs. in Jour. Chem. Soc.* [*London*], *108 (1915), No. 629, I, p. 109*).—Employing the material and method above noted, the author found that the degree of antagonism between sodium chlorid and calcium chlorid was greater than that between sodium chlorid and hydrochloric acid. Life was maintained longer in the most favorable proportions of the former pair than in those of the latter.

The results observed are held to afford evidence that the plasma membrane in plants is protein in character.

Physiological conditions in the large kelps of the Pacific Coast, G. B. RIGG (*Abs. in Science, n. ser., 42 (1915), No. 1094, p. 878*).—On account of attention being called to kelps as a source of potash fertilizer, the author has made an investigation of the physiological processes of a number of the rapidly growing species. The rapidity of growth is considered as favored by mechanical stretching by tidal currents, great turgidity due to high osmotic pressure in the cell sap, and an abundance of potassium influencing nuclear division.

It is said that there is more potassium than sodium in kelps, although the reverse is true of sea water. This is believed to be possible because of the greater permeability of the tissues for potassium and the change of potassium compounds into some other form which does not lower the diffusion gradients.

Attention is called to the differences of opinion as to the source and composition of the gases in the floats of marine algæ. The author expresses the opinion that the carbon dioxid for photosynthesis comes from either the gas in these floats or the carbonates in the sea water, rather than from the carbon dioxid of this water. Tidal currents are considered a factor in photosynthesis by keeping the fronds at the surface. The kelps are said to produce no starch, but their sugars may be a factor in the high osmotic pressure.

Quasi-experimental formation of ascidia in cotton leaves, F. E. LLOYD (*Abs. in Science, n. ser., 42 (1915), No. 1094, p. 879*).—The author reports growing small cotton plants in pots for more than a year which were subjected to severe physiological drought. Plentiful watering, aided by rising temperatures, resulted in forcing growth and the production of a large proportion of abnormally shaped leaves culminating in perfect ascidia raised on their proper petioloid supports. Such abnormalities are considered to rise from identical conditions with fasciations.

End results of desiccation and respiration in succulent plants, D. T. MacDougal, E. R. Long, and J. G. Brown (*Physiol. Researches, 1 (1915), No. 6, pp. 289–325, pls. 3, figs. 5; abs. in Science, n. ser., 42 (1915), No. 1094, pp. 879, 880*).—The authors give an account of experiments in which a large number of sound individuals of Echinocactus and several joints of Opuntia were deprived of water supply and compelled to carry on existence at the expense of accumulated water and food material.

It was found that an Echinocactus in the open may survive for no more than two years on its own supply of food material and water, while similar plants in diffused light have remained sound after six years of starvation. Nonreducing soluble sugars are said to be present in only minute proportions, if at all, in normal Echinocacti, but are noticeable constituents of the sap of desiccated ones. Extended desiccation and starvation made no alteration in the integument of Echinocactus, but in a plant which had been thus treated for 73 months the cuticle was thicker than normal, while the outer wall of the epidermal cells was thinner. The cytoplasm and nuclei in the epidermal system were reduced, but new cork layers were being formed as in normal plants. The stomata remained permanently open and many were in a collapsed condition. The palisade layer was thinner than in normal plants, the cytoplasm reduced to small masses in the angles of the cells, and the nuclei deformed and reduced in size. The most pronounced effect of starvation was exhibited by the cortex of Echinocactus.

Distribution of cacti with reference to the rôle played by root response, W. A. Cannon (*Abs. in Science, n. ser., 42 (1915), No. 1094, p. 877*).—According to the author's observations in southern Arizona, roots of cacti lie close to the surface of the soil and are subject to the maximum temperature changes, including the highest temperatures of the summer season. Experiments show that a high temperature is necessary for the best growth of the roots of cacti, and as active root growth takes place in midsummer it is suggested that the cacti as a family are limited to such regions as have summer rains, other conditions being favorable. In other regions of abundant moisture, but without the rains which characterize the warm season, cacti are either wholly wanting or constitute an insignificant part of the vegetation.

The distribution and succession of the flowers of the giant cactus in relation to isolation, D. S. Johnson (*Abs. in Science, n. ser., 42 (1915), No. 1094, p. 876*).—The author states that the flowers of the giant cactus growing about Tucson, Ariz., are rarely symmetrically grouped about the growing point of the stem. They are said to be generally most abundant on the east side and usually wanting on the west side. This phenomenon is considered to be brought about by differences in sunlight and air temperatures, the east side of the trunks being warmer than the west side.

The personation and multiplication of the fruits of certain Opuntias, D. S. Johnson (*Abs. in Science, n. ser., 42 (1915), No. 1094, pp. 878, 879*).—Attention is called to the fact that the fruits of certain cacti differ from those of most seed plants in not falling from the tree at the end of the growing season. In some forms, of which *O. fulgida* is one of the most striking examples, the fruit remains attached and growing, season after season. Primary flowers are formed from the lateral buds of the last year's branches. These shed the perianth five or six days after opening, and give rise to fruits which not only remain attached but also give rise to buds of secondary flowers. If these persistent fruits are allowed to remain attached they give rise only to flower buds, but if they are broken off and placed on moist soil the same areolæ develop roots, send out branches, and so start a new plant.

FIELD CROPS.

First aid to the settler, E. J. DELWICHE (*Wisconsin Sta. Bul. 260 (1915), pp. 3–43, figs. 29*).—This bulletin is intended for the use of the settler of small means in upper Wisconsin and offers suggestions of general interest on the selection of the land, methods of clearing and cropping, buildings and equipment, cooperation, and marketing.

Economy in feed products, N. LARSSON (*Nord. Mejeri Tidn., 30 (1915), No. 2, pp. 16–19*).—The varieties of root crops recommended for cultivation in southern and central Sweden are the Barres beet and the Drottning (Queen) turnip or ruta-baga.

Manure is considered the best fertilizer, but potash in the form of kainit gave excellent results with the beets, 37 per cent better than results obtained with pure potash salts. Phosphoric acid in the form of Thomas phosphate was very beneficial in the culture of beets. Nitrogen was likewise used, immediately before the sowing of the seeds, in the form of calcium cyanamid. This hastened the development of the beets. As previously reported by Bolin (E. S. R., 30, p. 822), a more abundant harvest was obtained by using half calcium cyanamid and half nitrate of soda than when either was used alone, and at less cost.

Report of the department of agriculture, J. C. PAGLIERY (*Estac. Expt. Agron. [Cuba], Informe An. 3 (1909–1914), pp. 9–27, pls. 3*).—This is a condensed report covering the period from 1909 to 1914, inclusive, and notes variety, fertilizer, and cultural tests with sugar cane and corn, variety tests with sweet potatoes, and data as to the classification of Cuban tobacco.

Alfalfa growing in Wisconsin, R. A. MOORE and L. F. GRABER (*Wisconsin Sta. Bul. 259 (1915), pp. 3–32, figs. 12*).—This bulletin discusses the production of alfalfa in Wisconsin, covering soil preparation, methods of seeding and harvesting, and notes regarding its value.

Inheritance of length of pod in certain crosses, J. BELLING (*U. S. Dept. Agr., Jour. Agr. Research, 5 (1915), No. 10, pp. 405–420, pl. 1*).—This article presents data obtained at the Florida Experiment Station showing the length measurements of pods in plants resulting from crossing reciprocally the Florida velvet bean (*Stizolobium deeringianum*) with the Philippine Lyon bean (*S. niveum*) carried to the fourth generation (E. S. R., 29, p. 228), and discusses the results qualitatively and quantitatively.

The author summarizes the investigation as follows: "A single genetic difference, E, is responsible for the main difference between short and long pods. This genetic difference segregates in normal Mendelian fashion. Factor E is completely quantitatively dominant, so that $E_2=Ee$. This factor acts as a multiplier, with a multiplying value of about 1.51. Minor factors for pod length also act as multipliers, with a combined multiplying value (when double) of about 1.42. These minor factors apparently show zero dominance, in the sense that if $A_2B_2C_2$ . . . are positive double factors with a combined multiplying value of x, the value of $AaBbCc$ . . . is $\sqrt{x}$."

Further experiments on inheritance in maize, H. K. HAYES and E. M. EAST (*Connecticut State Sta. Bul. 188 (1915), pp. 31, pls. 7*).—This paper is a report on the inheritance of certain differences in the endosperm of various maize races that have been made the basis of a division into the subspecies *Zea mays everta, indurata, indentata,* and *amylacea.* To these investigations a genetic study of the shape of seed which characterizes the so-called rice pop corns is added. The work continues that previously noted (E. S. R., 25, p. 736; 29, p. 333). Tables show the resulting corneous, floury, dented, and pointed characteristics of the various crosses.

In general, no matter which variety was used as the female parent, there was no immediate visible effect of the male parent in the endosperm of crosses between the flint and floury maize. The F_1 generation plants produced ears in which there was a clear segregation of corneous and floury seeds in a 1:1 ratio. This ratio was unaffected whether the F_1 ears were pollinated with pollen from either the pure flint or the pure floury parent. Seventy-six F_2 ears produced from a self-fertilized F_1 ear of the floury-flint cross, gave a ratio of 1 pure flint ear, 2 hybrid ears, and 1 pure floury ear. The flint and the floury ears bred true in later generations. A total of 69 self-fertilized ears showing segregation gave a ratio of 8,803 corneous seeds to 8,562 floury seeds.

There seemed to be a close agreement between the results of the cross between the floury and Leaming dent and those for the cross between the floury and flint. It was, however, more difficult to classify the seeds in the former cross as in the Leaming dent corneous starch is produced only on the sides of the seed, the cap and the immediate vicinity of the embryo being filled with soft starch. This difference in type of starch produced is evidently one factor, yet since F_3 families showed variations in the amount of corneous starch produced, there must be several minor factors which modify its development. "There is good evidence that at least some of these minor factors are factors which have a direct effect on totally different tissues. For example, the size and shape of the seed, which is at least partly controlled by the type of pericarp (a maternal character), has considerable influence upon the appearance of the starch. To put the matter roughly, in plants which fundamentally have the same zygotic possibilities as regards the type of starch in the endosperm, the amount of soft starch actually developed is directly proportional to the size of the seed."

The pollen of White Rice popcorn apparently had no effect on the character of the endosperm of the floury type. This is in agreement with the results of the crosses floury×flint and floury×dent. The F_1 ears showed the results of segregation, although in this case there was a range of variation from the floury to the corneous type. Seeds of this F_1 generation (F_2 seeds) produced a population of ears ranging from the pure corneous to the pure floury type. One uniformly floury ear bred true in F_3 and F_4 for the floury habit; three ears with purely corneous seeds also bred true. Two F_2 ears gave as variable an F_3 progeny as had been found in F_2, the ratio in this case being approximately 1 pure corneous ear to 6.2 intermediates and definite hybrids to 0.8 pure floury ears. Other F_2 ears gave a 1:2:1 ratio in F_3. Several self-fertilized intermediate F_2 ears bred comparatively uniformly, giving a progeny which contained more corneous starch than the floury parent but less than the White Rice popcorn parent.

In the cross between the White Rice and Pearl popcorn "the F_1 generation was of intermediate habit, there being some projection of the seeds at the point of attachment of the silk. Four selfed F_1 ears furnished F_2 generations. The progeny of these ears was variable, the seeds of some ears being as completely pointed as the White Rice pop parent, the seeds of others nonpointed like the Pearl pop parent, while the greater number were of various intermediate types. Of a total progeny of 263 individuals, 24 ears were classed as pure pointed like the White Rice parent. . . . A number of F_2 ears were self-pollinated, but none happened to be obtained which could be classed as typically pointed. One ear having seeds but slightly pointed (possibly nonpointed) was grown in F_3. The 21 ears produced were like the parent ear, showing only slight projections on the seeds at the tip of the ear."

In the cross between the White Rice pop (No. 64) and Leaming dent corns (No. 6) "the F_1 generation was intermediate as regards the pointed condition,

and there was segregation into pointed, nonpointed, and intermediate ears in F_2. Thirteen self-pollinated F_2 ears were grown in F_3. Of these, the following F_2 ears were classed as pure pointed (6×64)–6–6, (6×64)–6–3, (6×64)–4–8, (6×64)–4–9. Two of these ears, (6×64)–6–6 and (6×64)–6–3, bred true in F_3, while (6×64)–4–8 and (6×64)–4–9 showed segregation in F_3 with a total of 85 pointed and 31 intermediate pointed ears. Two self-fertilized ears, (6×64)–4–8–8 and (6×64)–4–8–3, were grown in 1914. One proved to be a pure pointed ear and the other again gave pure pointed and intermediate pointed seeds. These results might have been obtained if ear (6×64)–4–8 were homozygous for one factor for point and heterozygous for a second factor.

"Three self-fertilized F_2 ears of the intermediate class showed a range of variation in F_3 from pure-pointed to nonpointed ears. Six F_2 ears classed as nonpointed were proven to have been hybrids by the F_3 results. One of these (6×64)–4–7, produced 52 intermediate and 13 nonpointed ears. As no typically pointed ears were obtained it seems fair to conclude that the parent ear (6×64)–4–7 was heterozygous for one factor for pointed seeds. Two self-fertilized ears F_3 of line (6×64)–6–6 which bred true for the pointed habit in F_3 were grown in F_4. Ear (6×64)–6–6–4 gave a progeny of 35 ears, all of which were pure-pointed, while (6×64)–6–6–1 had a progeny of 23 pure-pointed ears and four with points more strongly developed than the intermediate class, but not so strongly developed as the 23 pure-pointed ears."

The White Rice pop parent contains only a small amount of floury starch, while the dent variety has corneous starch at the sides of the seed and floury starch at the cap and next the embryo. There was no effect on the development of the amount of corneous starch in Leaming dent (No. 6) due to the pollen from White Rice pop (No. 64). The F_1 generation cross produced ears with intermediate-sized seeds. These ears would have to be classed as dents.

"Two F_1 ears (6×64)–4 and (6×64)–6 were grown in F_2. Both populations showed a wide range of variation. The ears were classed as pure dent, nearly pure dent, half seeds dent, few seeds dent, and nondent. Ear (6×64)–4 had progeny of each class, while (6×64)–6 produced progeny in all classes except the nondent class. Thirteen F_2 ears were grown in F_3. Two nondented ears gave a progeny of nondented ears and ears with a few seeds slightly dented. No ears bred true in F_3 or F_4 for the pure dented condition, although some selections gave a progeny with a much larger proportion of dented ears than others. Twelve F_3 ears were grown in F_4. Ear (6×64)–6–5–3 produced the greater proportion of its progeny in the pure dent class.

Tests of corn varieties on the Great Plains, L. L. Zook (*U. S. Dept. Agr. Bul. 307* (*1915*), *pp. 19, figs. 4*).—This bulletin contains results of varietal tests of corn conducted on dry land and under irrigation at the following-named stations in the Great Plains area: Huntley, Mont., Newell, S. Dak., Mitchell and North Platte, Nebr., and Akron, Colo., in which several offices of the Department and the Nebraska Experiment Station cooperated.

Descriptive lists are given showing the dent, flint, and soft varieties of corn used in the tests. Tabulated data show yields of plats at the various stations.

The results covering the three years 1912, 1913, and 1914 have shown that small differences are of importance only when it is certain that such differences are due to potential varietal qualities and not chance fluctuations. It appears that the usual recommendation favoring locally-grown seed has in some cases been overemphasized by comparing averages rather than the performances of individual varieties and that to assume that a variety is best for a locality because it has had an opportunity to become acclimated may be as false a conclusion as to assume that a variety will do well in one locality because it has done so in some other locality. The range of adaptation of vari-

eties varies widely. The most outstanding varieties whose yields throughout the tests have remained uniformly good are White Australian, Martens White Dent, and U. S. Selection 133.

The production of a new variety of giant sugar corn, E. Heckel (*Compt. Rend. Acad. Agr. France, 1 (1915), No. 17, pp. 551–554*).—It is noted that during four successive years the sugar content of a giant Serbian variety of sweet corn was greatly increased by the removal of the tassel during August. In 1915 the total amount of sugar (saccharose and glucose) 20, 24, 26, and 28 days after emasculation is given as 9.35, 13.57, 11.6, and 9.6 per cent, respectively, as against 7.25, 6.6, 7.75, and 6.35 per cent for plants not emasculated.

[Fertilizer, varietal, and cultural experiments with corn on sandy loam soils], B. W. Kilgore, C. B. Williams, and R. W. Scott, Jr. (*Bul. N. C. Dept. Agr., 36 (1915), No. 5, pp. 5–52*).—This is a report of work with corn on the Edgecombe Test Farm during the period 1903–1909, inclusive, along the lines of previous reports (E. S. R., 31, pp. 629, 630; 33, p. 36).

The general summary of the results of this work indicates that in the production of corn on this soil, when only two fertilizer constituents are used nitrogen and phosphoric acid produce the largest net returns; that lime will prove beneficial when rightly applied; that a 3:1.5:7 fertilizer at the rate of 300 lbs. per acre may be expected to give the most satisfactory returns; and that there was practically no difference in the fertilizing value of dried blood and nitrate of soda.

Community production of Durango cotton in the Imperial Valley, A. McLachlan (*U. S. Dept. Agr. Bul. 324 (1915), pp. 16*).—This bulletin gives a history of the industry in the Imperial Valley, Cal.; discusses the progress due to organized effort and the varieties grown, viz, the short-staple, Egyptian, and long-staple Upland; notes that stabilization—i. e., the continuous production of a crop with a fixed high quality of fiber—is the great problem now confronting the cotton industry in the Imperial Valley; and comments on the relation of the grower, ginner, banker, and manufacturer to stabilization.

Flax culture for seed in Argentina, C. D. Girola (*El Cultivo del Lino para la Producción de la Semilla en la Argentina. Buenos Aires: Cabaut & Co., 1915, pp. 194, pls. 7, figs. 48*).—This book discusses the origin and the climatic and cultural requirements of flax grown for seed, and presents statistical data on the production and distribution of flax seed by countries and its importance as an article of commerce, particularly with reference to Argentina. Among the subjects specially treated are the history of flax culture in Argentina and the areas devoted to the crop by provinces, varieties cultivated and the growth of the plant in general, composition of the different parts of the flax plant, the use of fertilizers and rotations, soils adapted to flax and their preparation, seeding flax and taking care of the crop, plant and animal parasites, and the various phases of harvesting and marketing. The yield and total production of flax seed in the principal producing countries are compared, and data are given on the cost of production in Argentina. In addition, the chemical, botanical, and physical qualities of Argentina flax seed are reviewed, and the production of linseed oil, the uses of the oil cake and other residues, and the utilization of flax straw are described.

The fiber industry of Mauritius, F. A. Stockdale (*Dept. Agr. Mauritius, Gen. Ser., Bul. 5 (1915), [English Ed.] pp. 15, figs. 2*).—This bulletin describes the varieties of *Furcræa gigantea* that are grown in Mauritius, the methods of cultivation, and the manufacture of the fiber, and gives data as to the cost of production. It is concluded that "fiber production might become an important industry in the colony."

Growing Irish potatoes in Georgia, T. H. McHatton (*Bul. Ga. State Col. Agr., No. 95 (1915), pp. 6*).—This suggests methods of production for the first and second crops.

The frequency of low temperature in Vercelli and the effect on the cultivation of rice, B. Marcarelli (*Gior. Risicolt., 5 (1915), No. 22, pp. 355–360, fig. 1*).—In view of the fact that the temperature falls below 15° C. (59° F.) in July and August only the early varieties of rice are recommended.

Ash composition of upland rice at various stages of growth, P. L. Gile and J. O. Carrero (*U. S. Dept. Agr., Jour. Agr. Research, 5 (1915), No. 9, pp. 357–364*).—This gives results of work carried out at the Porto Rico Federal Station, which show the weights of various parts of upland rice (*Oryza sativa*) and the ash analysis of both the roots and above-ground parts when the plants were harvested at 18, 26, 48, 73, 103, and 123 days of age.

The absolute weights of the ash constituents of one whole plant above-ground at the ages of 103 and 123 days are given as follows: Carbon-free ash 4.427, 5.306 gm.; silica, 3.245, 3.896; lime, 0.102, 0.094; magnesia, 0.137, 0.137; iron, 0.012, 0.015; potash, 0.33, 0.655; soda, 0.337, 0.235; phosphoric acid, 0.172, 0.17; sulphuric acid, 0.277, 0.297; chlorin, 0.13, 0.152; and nitrogen, 0.143, 0.154 gm., respectively.

"The percentages of potash, phosphoric acid, and sulphur in the ash of the whole plant above-ground decreased with the age of the plant, while silica increased and nitrogen in the dry matter decreased with the age. As compared with 103 days, when the panicles were just out, the mature plant above-ground at 123 days with the seeds ripe contained an equal amount of lime, magnesia, and phosphoric acid, slightly more iron, sulphur, chlorin, nitrogen, and silica, much less soda, and considerably more potash. The percentages of iron in the ash of the green leaves and straw decreased regularly and markedly with the age of the plant, while the percentages of iron in the ash of the whole plant above-ground remained fairly constant after the 26-day-old sample. Previous to flowering the percentages of dry matter in the green plant and of ash in the dry matter seemed to be influenced by the effect of the weather on the growth of the plant."

Importance and character of the milled rice imported into the United States, F. B. Wise (*U. S. Dept. Agr. Bul. 323 (1915), pp. 8, pl. 1, fig. 1*).—This bulletin discusses the quantity and value of rice imported and the countries from which rice is imported, describes rice types, and gives in tabular form the results of mechanical and chemical analyses of imported rice.

The romance of teff, J. Burtt-Davy (*Univ. Cal. Jour. Agr., 3 (1915), No. 1, pp. 7–10*).—This gives a brief history of teff from its cultivation in Abyssinia to its present distribution in South Africa, and describes its cultivation and uses in South Africa. An analysis of teff hay is given as moisture 8.88, protein 6.21, ether extract 1.21, soluble carbohydrates 39.08, crude fiber 39.07, and ash 5.55 per cent.

HORTICULTURE.

The Bradley bibliography.—III, Arboriculture—economic properties of woody plants, A. Rehder (*Cambridge, Mass.: Riverside Press, 1915, vol. 3, pp. X+806*).—This volume of the Bradley Bibliography (E. S. R., 31, p. 239) contains the titles of publications relating to arboriculture and to the economic properties and uses of woody plants, including important articles in periodicals and other serial publications. The principal botanical, horticultural, agricultural, and pharmaceutical periodicals have been completely excerpted, and many papers extracted from less important technical periodicals and from

those of a general character. A complete enumeration of all publications devoted to pomology and the cultivation of fruit trees has not been attempted. Only separate works on these subjects is included.

[Economic plants at the Agronomic Experiment Station, Santiago de las Vegas, Havana], J. T. ROIG (*Estac. Expt. Agron. [Cuba], Informe An., 3 (1909–1914), pp. 58–88, pls. 9*).—Notes are given on various classes of economic plants being tested in the gardens of acclimatization and propagation and in the arboretum of the experiment station, including a list of the principal exotic plants that are being cultivated by the station.

Adaptability of certain Philippine plants to propagation by cuttings and marcottage, J. C. MIRAFLORES (*Philippine Agr. and Forester, 4 (1915), No 7, pp. 142–150*).—The results are given of a series of experiments undertaken to determine the adaptability of a number of Philippine plants to propagation by cuttings and layerage.

Report of the committee on revision of catalogue of fruits and vegetables, J. W. FIROR ET AL. (*Bul. Ga. State Col. Agr., No. 89 (1915), pp. 125–149*).—This comprises a catalogue of fruits, nuts, and vegetables for Georgia, recently revised by the committee on revision of catalogue of the Georgia State Horticultural Society. The State is divided into the upper or mountainous, middle, southern, and coastal regions. The information for each variety comprises the origin, season, and use and the region for which it is adapted.

Fertilizers for fruits and vegetables, B. HOY (*Brit. Columbia Dept. Agr., Hort. Branch Circ. 28 (1912), pp. 8*).—A popular discussion of various kinds of fertilizers with special reference to their value for fruits and vegetables.

Spray and practice outline for 1915, H. J. EUSTACE and R. H. PETTIT (*Michigan Sta. Spec. Bul. 73 (1915), pp. 24, figs. 7*).—This bulletin discusses the general spray treatment for orchard and small fruits as well as cucumbers, muskmelons, potatoes, and tomatoes. Directions are also given for the preparation and use of various insecticides and fungicides.

Analyses of some materials sold as insecticides and fungicides, A. J. PATTEN and D. C. KELLOGG (*Michigan Sta. Spec. Bul. 74 (1915), pp. 3–11*).—Analyses are here given of some 104 samples of various materials collected in Michigan. They include lime-sulphur solutions, soluble sulphur compound, lead arsenate, Paris green, Bordeaux mixture, tobacco products, and miscellaneous materials. The more salient features of the state inspection law are included in the bulletin.

Vegetable gardening in Georgia, T. H. MCHATTON and J. W. FIROR (*Bul. Ga. State Col. Agr., No. 88 (1915), pp. 54, figs. 6*).—A popular treatise on home and farm vegetable gardening with special reference to Georgia conditions. In addition to the general principles of vegetable growing, information is presented relative to planting distances for various vegetables and the control of insect pests and diseases, including directions for making sprays. Specific notes on the culture of the more important truck crops are also given.

The home vegetable garden for southern interior sections of British Columbia, H. THORNBER (*Brit. Columbia Dept. Agr., Hort. Branch Circ. 24 [1912], pp. 8, fig. 1*).—A popular treatise on this subject.

Cultural experiments with vegetables on the Schleswig-Holstein moors, A. J. WERTH (*Mitt. Ver. Förd. Moorkultur Deut. Reiche, 33 (1915), Nos. 16, pp. 336–343, figs. 2; 17, pp. 361–365, figs. 4*).—An account is given of cultural and variety tests with vegetables conducted on the low and high moors in Schleswig-Holstein in 1913 and 1914.

The bonavist, lablab, or hyacinth bean, C. V. PIPER and W. J. MORSE (*U. S. Dept. Agr. Bul. 318 (1915), pp. 15, pls. 2*).—An account of the bonavist bean (*Dolichos lablab*) with reference to its cultural characteristics, seed production,

varietal characters, value for human food, and botanical names. Notes are also given on the various introductions of *D. lablab* made by the Office of Foreign Seed and Plant Introduction from 1899 to 1914. A bibliography of cited literature is appended.

The bonavist bean is of value both for its edible pods and as an ornamental. The authors recommend that it be generally grown from Maryland and Kentucky southward. For planting in corn, it has about the same value as cowpeas.

The Bermuda onion, F. W. MALLY (*Texas Dept. Agr. Bul. 46 (1915), pp. 56*).—This comprises a guide to the culture of Bermuda onions in south Texas. In addition to a detailed account of methods of culture, harvesting, and marketing, considerable information is given relative to various soil types in south Texas and soil improvement by means of cover crops and organic and inorganic fertilizers.

Peas as an orchard green manure and cover crop, F. GARCIA (*New Mexico Sta. Bul. 99 (1915), pp. 21, figs. 6*).—An account of the use of various kinds of peas for green manure and cover crops, based upon orchard cover crop experiments conducted by the station from 1911 to 1914, inclusive, the results of which are here noted.

The experiments show that excellent results can be had with such varieties of peas as the Black-eyed Marrowfat, White-eyed Marrowfat, San Luis Valley, Colorado Stock, Golden Vine, and sweet peas. The sweet pea vines proved to be more resistant to cold during the winter. The temperatures which killed from 3 to 5 in. of growth of the vines of other peas did not materially injure the sweet peas. There was no material difference in the resistibility to cold of the different varieties of the field peas tried or in the amount of vine growth produced. All varieties of field peas planted during the fall months proved to be too tender and succulent for the extreme temperatures during the winter. Plantings made during December to March, inclusive, were not injured by any of the low temperatures during that period, and all vines from such plantings grew large enough for plowing under by May 15. A very dense vine growth was secured by seeding broadcast at the rate of 65 lbs. of seed per acre. Where irrigation is practiced the land should be irrigated immediately after the seed is sown to produce germination, and the vines should be irrigated when they are plowed under to cause the quick decay of the vegetable matter.

The top-working of fruit trees, H. THORNBER (*Brit. Columbia Dept. Agr., Hort. Branch Circ. 26 (1912), pp. 8, figs. 6*).—This comprises practical directions on top-grafting fruit trees.

Varieties of fruit recommended for commercial planting, compiled by R. M. WINSLOW (*Brit. Columbia Dept. Agr., Hort. Branch Circ. 29 (1912), pp. 5*).—This comprises a list of varieties of orchard and small fruits recommended for commercial planting in different sections of British Columbia.

[Varieties of fruit at the Agronomic Experiment Station, Santiago de las Vegas, Havana], H. A. VAN HERMANN (*Estac. Expt. Agron. [Cuba], Informe An., 3 (1909–1914), pp. 33–51, pls. 2*).—Data are given on varieties of temperate and tropical fruits growing on the station grounds.

Methods of fruit picking and handling, E. SMITH (*Brit. Columbia Dept. Agr., Hort. Branch Circ. 27 (1912), pp. 7, fig. 1*).—A discussion of methods of handling fruit, including some data on fruit handling investigations conducted by the British Columbia Department of Agriculture.

The author finds that at present an average of over 26 per cent of British Columbia apples are injured through careless handling in the orchards, and that over 60 per cent received bruises or punctures before reaching the market. Decay in soft fruits, such as peaches, plums, cherries, etc., has been reduced by careful handling from as high as 41 per cent to 2 per cent during 12 days in

the transit temperature. The fact that British Columbia peaches are usually overripe and decay rapidly on the market is attributed to the 36 to 84 hours' delay between picking and the refrigerator car. Successful peach shipping districts allow but 12 hours between picking and refrigeration.

Economies in apple harvesting, E. H. SHEPARD (*Better Fruit, 10 (1915), No. 6, pp. 13–15, 25, 26*).—A paper on this subject presented before the Washington and Oregon State horticultural societies.

Know orchard costs, G. M. TWITCHELL (*Amer. Agr., 97 (1916), No. 1, p. 13*).—The author gives cost data and returns secured from an old apple orchard over a series of years.

Grimsby precooling and experimental fruit storage.—Cherry package test, season of 1915, E. SMITH (*Agr. Gaz. Canada, 2 (1915), No. 11, pp. 1050–1054, figs. 5*).—The object of the tests here reported was to secure information that would lead to a more standard package for Canadian sweet and sour cherries. Demonstration shipments of various kinds of packages were made.

For sour cherries the 6-qt. basket packed in the orchard gave the highest net returns. Warehouse packs suffered more from wastage. For sweet cherries the highest net returns were secured from the 24-full pint strawberry crate.

Culture of small fruits for the interior districts of British Columbia, M. S. MIDDLETON (*Brit. Columbia Dept. Agr., Hort. Branch Circ. 25 (1912), pp. 4*).—The methods employed by successful growers are here described.

Notes on economic plants, J. JONES (*Imp. Dept. Agr. West Indies, Rpt. Agr. Dept. Dominica, 1914–15, pp. 5–11*).—Data are given on tapping experiments with Castilla rubber, together with analyses of latex obtained from Hevea and Funtumia trees. It is concluded that *Hevea brasiliensis* is the only rubber tree that can be grown in Dominica with any prospect of success.

Of the eucalypts grown in the Botanic Gardens *Eucalyptus tereticornis* and *E. citriodora* have given the best results in rapidity of growth and in the production of timber. An 18-year-old tree of the latter species which was felled during the year was 7 ft. in girth 3 ft. from the ground, and 3 ft. 6 in. in girth 60 ft. from the ground, at which height the trunk branched. The tree was 106 feet high.

Notes are given on condition of limes budded on sour orange stock, together with yield data on grafted cacao trees.

Tropical and semitropical fruits, exclusive of citrus fruits, E. O. FENZI (*Agr. Colon. [Italy], 9 (1915), Nos. 1, pp. 40–53; 2, pp. 97–116; 3, pp. 167–182; 4–5, pp. 250–304; 6, pp. 359–373; 7, pp. 420–449; 8, pp. 481–515; 9, pp. 557–568; 10, pp. 620–634; 11, pp. 681–698, figs. 59*).—This comprises a manual of 727 species of tropical and semitropical fruits, including the country of origin; the botanical nomenclature; a brief description of the foliage, flower, and fruit; the chemical composition of the fruit, where known; methods of propagation; and more extended notes on those fruits which are now commonly cultivated. A table is given in which the various species are grouped according to the uses of the fruit.

The manual has been prepared with special reference to the extensions and development of tropical and semitropical fruit culture in Italy and the Italian colonies.

Progress in the chief industries, J. JONES (*Imp. Dept. Agr. West Indies, Rpt. Agr. Dept. Dominica, 1914–15, pp. 17–22*).—A statistical report for 1914 on the lime and cacao industries as well as coconuts and minor products.

Report on manurial experiments, J. JONES (*Imp. Dept. Agr. West Indies, Rpt. Agr. Dept. Dominica, 1914–15, pp. 34–44*).—A progress report on fertilizer experiments with cacao and limes in Dominica (E. S. R., 32, pp. 45, 46).

After thirteen years of continuous manurial treatment along the same lines, it appears that under conditions prevailing at the Botanic Gardens a steady annual yield of from 1,100 to 1,200 lbs. of cured cacao can be obtained without the use of manures. Experience has shown, however, that cacao trees grown in this way are susceptible to the attacks of fungus diseases, which are very difficult to combat. The mulched plat continues to yield higher than any of the other plats and for the current year gave 1,947 lbs. of cured cacao per acre, or 779 lbs. more than the control plat. The vigor and general appearance of the trees, in spite of the heavy yields, is very striking. Mulching costs approximately 80 shillings ($19.20) per acre.

The experiments with limes which were started in 1913 have given no conclusive results thus far. Judging from the appearance of the trees the outstanding feature is the excellent growth made by the complete manure plat, and the slow but steady improvement in the condition of the mulched plat.

Coconut culture, J. R. Johnston (*Estac. Expt. Agron. Cuba Circ. 49 (1915), pp. 11, pls. 3*).—A practical treatise on coconut culture, discussing soils, selection of seed, varieties, propagation, planting, cultivation, fertilizers, companion crops, harvesting yield, diseases, and insect pests.

Flowering plants for St. Louis (*Missouri Bot. Gard. Bul., 3 (1915), Nos. 9, pp. 117–121; 10, pp. 126–134; 11, pp. 141–151*).—This comprises a descriptive list of trees, shrubs, perennials, and annuals, prepared under the direction of the Missouri Botanical Garden, as suitable for culture in the latitude of St. Louis.

Hardy roses: Their culture in Canada, W. T. Macoun and F. E. Buck (*Canada Expt. Farms Bul. 85 (1915), pp. 39, figs. 15*).—As a result of experimental tests with roses extending from Prince Edward Island to British Columbia it has been found that roses may be grown fairly readily in many districts where it was formerly supposed they could not be produced except under glass. The present bulletin is believed to be applicable throughout Canada. It discusses sites and soils suitable for roses; plants and planting; cultivation, watering, and manuring; pruning; winter protection; inects and fungus enemies; and propagation. Descriptive varietal lists are given of various types of roses, including information relative to the varieties that have succeeded best. Notes are also given on the origin of popular classes of roses, as well as on the appearance of some modern roses. The bulletin concludes with a list of roses tested at Ottawa from 1891 to 1911.

It is concluded in general that *Rosa rugosa* and hybrids, Austrian briars, Provence or cabbage roses, damask roses, and moss roses need little or no protection in most parts of Canada. All other roses must be given more or less protection during the winter, except in very favored localities.

The art of landscape architecture, its development and its application to modern landscape gardening, S. Parsons (*New York: G. P. Putnam's Sons, 1915, pp. XXI+347, pls. 45*).—An exposition on the evolution of landscape gardening and different methods of laying out grounds. The subject matter is considered under the general headings of the laying out of a park or estate, the size and extent of an estate, inclosures, the location of buildings, grass spaces, roads and paths, water, islands, rocks, grading and shaping grounds, plantations, maintenance, gardens, public parks, and choice trees and shrubs.

A bibliography of works on landscape gardening is appended.

Landscape gardening as applied to home decoration, S. T. Maynard (*New York: John Wiley & Sons, 1915, 2. ed., rev. and enl., pp. XIX+396, pl. 1, figs. 190*).—The present edition of this work (E. S. R., 11, p. 852) has been revised

and largely rewritten to conform with the progress made in the past 15 years in out-of-door house decoration, and to include the greatly increased list of plant material now in use for this purpose.

Luther Burbank, his life and work, H. S. WILLIAMS (*New York: Hearst's International Library Co., 1915, pp. XII+333, pls. 40*).—A summarized account of the life and work of Luther Burbank, largely based on Burbank's own account of his life work (E. S. R., 32, p. 143).

FORESTRY.

The forests of Anne Arundel County, F. W. BESLEY (*Baltimore: Md. State Bd. Forestry, 1915, pp. 28, pls. 4*).—This report embraces the results of a survey of forest conditions in Anne Arundel County, Md., which was made by the state forester in 1909. Information is given relative to the character and stand of timber, the uses of the forest, methods of cutting, amount of timber now being cut, and damage by fire and other destructive agencies. The report is largely supplemented by a forest map of the county.

Brazilian woods, A. L. M. GOTTSCHALK (*U. S. Dept. Com., Com. Rpts., No. 301 (1915), pp. 1174–1177*).—A consular report on Brazilian woods, including tabular data showing exports of various hardwoods for five years and the specific weights of the principal hardwoods of Brazil employed in construction work or in furniture making, together with notes on the favorite woods of Brazil.

Contribution to the knowledge of some timbers of Eritrea, L. SENNI (*Bol. R. Giard. Colon. Palermo, 1 (1914), No. 2, pp. 159–168*).—In continuation of a previous report (E. S. R., 20, p. 844) brief notes are given on the structure and other characteristics of the woods of several timber trees growing in Eritrea, Africa.

The testing of forest seeds during 25 years, 1887–1912, J. RAFN (*[Copenhagen]: Author, 1915, pp. 91, pl. 1, figs. 5*).—This brochure comprises as a whole a record of tests of the seed of various conifers and broad-leaved trees conducted at the Scandinavian Forest Seed Establishment during the past 25 years.

Five years' growth on Douglas fir sample plats, T. T. MUNGER (*Proc. Soc. Amer. Foresters, 10 (1915), No. 4, pp. 423–425*).—Tabular data are given showing the growth of permanent sample plats in second growth Douglas fir forests in the Cascade National Forest.

Differentiation of the oaks by histological methods, F. W. MULSOW (*Kans. Univ. Sci. Bul., 9 (1915), No. 20, pp. 271–277, pls. 5*).—In this work four species of native oaks are compared as to their histological structures and characteristics. The species studied are *Quercus rubra*, *Q. schneckii*, *Q. coccinea*, and *Q. macrocarpa*.

The author concludes that there are enough differences in the various tissues of the oaks to enable one to distinguish the species by histological methods. There were found differences in the leaf sufficient to distinguish the species, and in addition there were further distinguishing differences in the stem and acorns.

A study of the histological variations of Quercus muhlenbergii, J. A. ELLIOTT (*Kans. Univ. Sci. Bul., 9 (1914), No. 4, pp. 45–54, pls. 5*).—This paper reports a study by histological methods of variations in four native oaks, all classified in the Gray Herbarium as *Quercus muhlenbergii*.

Teak in Siam and Indo-China, F. H. SMITH (*U. S. Dept. Com., Bur. Foreign and Dom. Com., Spec. Agents Ser., No. 108 (1915), pp. 21*).—In this report an introductory account is given of the properties and utilization of teak wood, after which the author discusses the various grades and prices of teak wood

and methods obtaining in the industry. Detailed statistics are also given of teak wood exports from Siam and Indo-China.

Annual report on the forest administration in Ajmer-Merwara for the year 1913–14, H. CHAND (*Ann. Rpt. Forest Admin. Ajmer-Merwara, 1913–14, pp. 6+32*).—This comprises the usual progress report on the administration and management of the state forests of Ajmer-Merwara. Data relative to forest areas, forest surveys, working plans, silvicultural operations, yields, revenues, expenditures, etc., are appended in tabular form.

The need of working plans on National Forests and the policies which should be embodied in them, B. P. KIRKLAND (*Proc. Soc. Amer. Foresters, 10 (1915), No. 4, pp. 341–370*).—This article comprises as a whole a plea for certain changes in the National Forest policy in dealing with the timber resources on the National Forests. The author first considers the desirability of working plans and then discusses a number of fundamental policies which, in his opinion, should be provided for in working plans.

Regional forest plans, D. T. MASON (*Proc. Soc. Amer. Foresters, 10 (1915), No. 4, pp. 371–375*).—In this article the author advocates the preparation of working plans for forest regions rather than for individual National Forests within a given forest region.

Working plans, H. H. CHAPMAN (*Proc. Soc. Amer. Foresters, 10 (1915), No. 4, pp. 376–382*).—A discussion of forest working plans with special reference to their application on the National Forests.

Some notes on forest ecology and its problems, R. H. BOERKER (*Proc. Soc. Amer. Foresters, 10 (1915), No. 4, pp. 405–422*).—This paper comprises as a whole a discussion of the methods, scope, and importance of forest ecology, together with a classification and summary of its problems.

Light burning at Castle Rock, S. B. SHOW (*Proc. Soc. Amer. Foresters, 10 (1915), No. 4, pp. 426–433*).—In order to secure reliable data on the harmful or beneficial effects of light burning on forest growth, experiments were started at Castle Rock, Cal., in the spring of 1911. The timber in the experimental area consisted of yellow pine, with a slight admixture of sugar pine, Douglas fir, incense cedar, and California black oak. From the data secured it is concluded that light burning is a failure as a fire-protective measure, and that the damage to reproduction is so great that the practice of light burning is precluded where the establishment of young growth is desired.

Brush disposal in lodgepole-pine cuttings, D. T. MASON (*Proc. Soc. Amer. Foresters, 10 (1915), No. 4, pp. 399–404, fig. 1*).—The author presents some evidence to show that the piling and burning of brush for the purpose of protecting forest areas from fire may be unnecessary and unprofitable where grazing is feasible. A diagram is given of a proposed experiment which it is planned to conduct to determine much more accurately the interrelations of brush disposal, fire hazard, grazing, and reproduction.

A new aspect of brush disposal in Arizona and New Mexico, W. H. LONG (*Proc. Soc. Amer. Foresters, 10 (1915), No. 4, pp. 383–398*).—This article deals specifically with the rapidity with which brush rots and with the fungi causing this rotting under different methods of disposal. The three methods of disposal considered are piling, scattering, and merely pulling the brush out of the way of reproduction.

Uniformity in the forest fire legislation affecting railroad operation and lumbering, P. T. COOLIDGE (*Proc. Soc. Amer. Foresters, 10 (1915), No. 4, pp. 434–452*).—In this article the author describes the legislation enacted in different States with special reference to certain characteristics which render it effective or otherwise.

DISEASES OF PLANTS.

International phytopathologic collaboration, J. Eriksson (*Phytopathology, 5 (1915), No. 3, pp. 133–138*).—The author reviews the steps that have been taken in Europe to secure a systematic collaboration for the control of plant diseases, and expresses the hope that this country will take the initiative and assume charge of an organized international collaboration against diseases of cultivated plants. It is maintained that the means adopted in Europe have not advanced phytopathological research, which is considered fundamental to proper regulatory control.

Some neglected phases of phytopathology, J. G. Grossenbacher (*Phytopathology, 5 (1915), No. 3, pp. 155–162*).—The author describes some types of phloem and bark diseases of herbs and woody plants in order to call attention to some of the problems in phytopathology which, he considers, should receive more general attention, not only because they are of scientific interest but also because they are important from an economic standpoint.

[Plant diseases in British Guiana], C. K. Bancroft (*Rpt. Dept. Sci. and Agr. Brit. Guiana, 1913–14, App. 2, pp. 18–20*).—In a report on the work of the botanic gardens at Georgetown, an account is given of plant diseases investigated during 1913–14.

It is stated that the dry disease of sugar cane due to *Marasmius sacchari* has shown a marked increase on some plantations since its first appearance in Berbice in 1907, and that it has become widely distributed in the colony.

A leaf disease of the sisal hemp noted on one estate was found to be due to *Colletotrichum agaves*.

Investigation has been begun on bud rot of coconut palm, from which six pure strains of bacilli of the *Bacillus coli* type have been isolated. Inoculation with one of these has resulted in the death of the plant.

A disease prevalent on the fruits of peppers was found to be due to *C. nigrum*. Rose leaf mildew (*Sphærotheca pannosa*) responded readily to treatment with flowers of sulphur, but less favorable results followed the use of liver of sulphur or of dilute sulphuric acid.

A leaf spot of orchids was ascribed to *Uredo orchidis*. A leaf disease of nursery plants of Hevea was found to be due to a fungus considered by Massee to be a new species and named *Passalora heveæ*. Specimens of rose trees were received which showed the development of crown gall (*B. tumefaciens*). A leaf disease of coconut palm caused by *Pestalozzia palmarum* was observed in several places.

Fomes semitostus was found on a single dead stump in the forest, this being supposedly its first record in the tropical regions of America.

Brown root disease of Hevea, due to *Hymenochæte noxia*, was noted in one or two instances. *Eutypa caulivora* was identified on Hevea material brought from Ceylon. Several cases of the mango fruit disease (*Glœosporium mangiferæ*) were noted in the botanic gardens.

Angular leaf spot of cucumbers, E. F. Smith and Mary K. Bryan (*U. S. Dept. Agr., Jour. Agr. Research, 5 (1915), No. 11, pp. 465–476, pls. 7*).—A description is given of an angular leaf spot of cucumbers which, it is said, has been known to occur in this country for many years, being widespread in the Eastern and Middle Western States.

The disease is characterized by angular brown spots which tear or drop out when dry, giving the leaves a ragged appearance. In the early stages a bacterial exudate collects in drops on the lower surface during the night and dries whitish. Young stems and petioles may become soft rotted or cracked open,

and a virulent outbreak has reduced the crop by destroying a large portion of the active part of the leaves.

Angular leaf spot is said to be caused by *Bacterium lachrymans* n. sp., which enters through the stomata, no wounds being necessary. A technical description of the organism and its morphological and physiological characters are given. It is said to be quite different from that described by Burger (E. S. R., 31, p. 747) in that it does not cause soft rot of the fruit.

From laboratory tests with copper sulphate the authors conclude that Bordeaux mixture properly applied would serve to control this disease.

Investigations on potato diseases (sixth report), G. H. PETHYBRIDGE (*Dept. Agr. and Tech. Instr. Ireland Jour., 15 (1915), No. 3, pp. 491–526, pls. 12; abs. in Jour. Bd. Agr. [London], 22 (1915), No. 3, pp. 269, 270*).—A continuation is reported of the investigations previously noted (E. S. R., 32, p. 239).

The various comparative trials of proprietary fungicidal preparations made during recent years in Ireland, some of which are described, are said to indicate that properly prepared home-made Bordeaux and Burgundy mixtures are preferable to any others tested for use against potato blight (*Phytophthora infestans*), as regards both efficiency and cost. The solutions of 1 per cent strength gave practically as good results as those containing 2 per cent of copper sulphate. Little if any advantage resulted from employment of a potassium instead of a sodium salt in Burgundy mixture for spraying. The source of the blight year after year is regarded as still unsettled.

Stalk disease (*Sclerotinia sclerotiorum*) was studied, and it appears that lateness of planting confers a degree of protection. The spores appear to be carried by the wind and may cause infection of the aerial parts of weakened or wounded plants at some distance. The yellowing leaves while still attached appear to offer a favorable area for infection by these spores, this fact and the leaf scars probably explaining the prevalence of attack at the nodes.

The symptoms of pink rot were experimentally produced by inoculation with *P. erythroseptica.* The cytological work on this fungus begun by Murphy (E. S. R., 33, p. 53) has been concluded, and is to be published in full.

Corky or powdery scab (*Spongospora subterranea*) attacked foreign varieties when planted on infected soil in the west of Ireland. Petrol proved inefficient for control of this fungus.

Studies recently made are considered to prove the identity of the collar fungus (*Hypochnus solani*) with that formerly known as *Rhizoctonia solani*, justifying the rejection of the latter name.

Comparative experiments with the dry scab or silver scurf fungus (*Spondylocladium atrovirens*) suggested that this fungus may attack only while the tuber is still growing, perhaps starting in the dead, exfoliating cells.

Brown scab is apparently not caused by mechanical irritation, but is due to a widely distributed soil organism, not yet determined, which appears to be sensitive to acids and alkalis. The skin spot, which is provisionally regarded as due to *Spicaria solani*, is rather infrequent, and apparently of no serious practical importance.

It is thought, as a result of work not yet completed, that different forms of dry rot exist, but that all are caused by fungi of the genus Fusarium.

The investigations in connection with the Verticillium disease, which have been continued since 1909, showed during the past season that this disease can be produced in healthy plants by inoculation.

Leaf roll diseases of the potato, O. APPEL (*Phytopathology, 5 (1915), No. 3, pp. 139–148*).—In a lecture which was given at a number of universities in this country, the author described some of the diseases of potatoes characterized by curled or rolled leaves, among them curly dwarf, a nonparasitic leaf roll,

fungus wilt and bacterial ring diseases which attack the vascular tissues, and a Rhizoctonia and a blackleg which are classed as foot diseases.

An account is included of the system of inspection adopted in Germany to secure certification of seed potatoes.

A preliminary study of ergot of wild rice, FAITH FYLES (*Phytopathology, 5 (1915), No. 3, pp. 186–192, pl. 1*).—In connection with studies of the Canadian wild rice (*Zizania aquatica* and *Z. palustris*) the author reports often having noticed ergot among the seed, and the questions arose whether this ergot was identical with the typical ergot of rye, and whether other cereals and other grasses growing in the neighborhood would be in danger of infection by it. Material was collected and a series of experiments carried on in which only negative results were obtained for species other than wild rice.

The author believes, from certain morphological and other differences, that the form experimented with is a distinct species, and it will be a subject for further report.

The loose kernel smut of sorghum, A. A. POTTER (*Phytopathology, 5 (1915), No. 3, pp. 149–154, pl. 1, figs. 2*).—In a previous publication (E. S. R., 27, p. 545) the author reported the occurrence of *Sphacelotheca cruenta* on sorghum in this country, and in the present paper an attempt is made to clear up confusion between this species and *S. sorghi*. Both species are present as kernel smuts of sorghum, *S. cruenta* being now known to have occurred in America as early as 1885.

It is claimed that infection may be prevented by the usual seed-disinfecting treatments.

A bibliography is given.

Experiments on the susceptibility of sweet potato varieties to stem rot, L. L. HARTER and ETHEL C. FIELD (*Phytopathology, 5 (1915), No. 3, pp. 163–168*).—In a previous publication (E. S. R., 32, p. 50) the authors gave an account of investigations, which had extended over two years, on stem rot of sweet potatoes due to *Fusarium hyperoxysporum* and *F. batatatis*.

In the present paper an account is given of the results of variety tests, carried on in the seasons of 1913 and 1914, which showed marked resistance on the part of some varieties, but the authors claim that a substitution of one variety of sweet potatoes for another can not be made based solely on the resistance to these diseases. Some varieties which produce potatoes of exceptional merit in certain localities are said to be practically worthless in others.

How to disinfect tobacco plant beds from root rot fungus (Thielavia), A. D. SELBY, T. HOUSER, and J. G. HUMBERT (*Ohio Sta. Circ. 156 (1915), pp. 5–8, fig. 1*).—Soil sterilization of seed beds by means of steaming and the use of formalin is described, the advantages and disadvantages of each method being pointed out.

Apple rust and its control in Wisconsin, L. R. JONES and E. T. BARTHOLOMEW (*Wisconsin Sta. Bul. 257 (1915), pp. 1–30, figs. 15*).—A description is given of the apple rust due to *Gymnosporangium globosum* and *G. juniperi-virginianæ*. The latter species is said to be the more widely spread and injurious in Wisconsin.

Attention is called to the relation between the fungus occurring on the cedar and the apple, and, as orchard planting is said to be on the increase in the regions where red cedars abound, suggestions are given for the avoidance of loss through the control of the disease by spraying, cutting out the cedar trees, and use of relatively resistant varieties of apples.

Varietal resistance of plums to brown rot, W. D. VALLEAU (*U. S. Dept. Agr., Jour. Agr. Research, 5 (1915), No. 9, pp. 365–396, pls. 3*).—The results are given of studies made at the Minnesota Experiment Station on the resistance of

plums to the brown rot fungus, which have been carried on since the spring of 1913. The fungus in Minnesota is believed to be identical with that found in other parts of this country and with *Sclerotinia cinerea* in Europe.

Infection may take place through the uninjured skin at any time during the development of the plum fruit. Varieties show variations in resistance to rot after the hyphæ have gained entrance to the fruit. Resistance is considered to be correlated with a thick skin, the production of parenchymatous plugs which fill the stomatal cavity, the production of corky walls in the lining cells of the stomatal cavity, and firmness of fruit after ripening. No relationship was observed between the oxidase content of the fruit and resistance, or between tannin content and resistance.

The brown rot is said to be essentially a ripe rot, affecting the plums most noticeably as soon as they begin to soften as a result of ripening, due to the solution of the middle lamella. Varieties which are resistant remain firm on ripening. The hyphæ of the fungus are said to be entirely intercellular. All attempts to demonstrate the presence of an enzym capable of dissolving the middle lamella or to extract it from a culture of the fungus in apple cider proved futile.

The rot caused by *S. cinerea* is a firm rot, due to the mechanical support of the hyphæ which completely fill the intercellular spaces left by the collapse of the host cell walls. A soft rot is produced by *Penicillium expansum*, which does not produce extensive hyphæ and therefore does not give mechanical support to the rotted tissue.

A bibliography of literature cited is given.

Experimental spraying for blackberry anthracnose in 1915, H. L. REES (*Washington Sta., West. Wash. Sta., Mo. Bul., 3 (1915), No. 8, pp. 2–10, figs. 4*).—Continuing previous work (E. S. R., 33, p. 54), the results are given of experiments for the control of blackberry anthracnose in western Washington.

It was found that the disease can be successfully and profitably controlled by two sprayings, the first just before flowering, using Bordeaux mixture 5:5:50, the second 2 or 3 weeks after the petals have fallen, Burgundy mixture being employed. The author states that neither cutting out the canes nor spraying in the fall is necessary for the control of anthracnose.

Attention is called to the fact that much of the loss is due to the dying of canes through inadequate drainage and insufficient plant food.

Formulas for the preparation of the fungicides are given. It is recommended that resin fish oil soap, at the rate of 1 lb. to 50 gal. of spray, be added to secure better distribution and greater adhesiveness of the mixtures.

Observations relative to an obscure grape affection, F. E. GLADWIN (*Phytopathology, 5 (1915), No. 3, pp. 169–174, fig. 1*).—The author states that his attention was attracted in 1910 to a sickly appearance of the leaves of Concord grapes in a young vineyard. In 1911 and 1912 the disease was reported in the same vineyard and also in some where the vines had been set for a considerably longer time. Except in the oldest vineyards, the same conditions appeared in 1913 and 1914.

During the dormant season there are no evidences of the trouble, but early in July the upper leaves of the shoots show a streaked yellow between the veins. Later other leaves on the shoots develop a pale discoloration, which is more marked near the margin of the leaf. As the season advances, the tissues dry and become functionless. The infected vines produce few shoots, the fruit is abnormal, and the woody growth materially checked.

No fungus or other organism could be definitely associated with the trouble, but a study made of the soil indicated that the disease was due to a lack of

moisture in the soil or to the inability of the vines previously affected to absorb the amount of water needed. Observations on other vineyards indicate that the trouble is not uncommon, as it is invariably found in situations where the water supply is inadequate.

Citrus diseases of Florida and Cuba compared with those of California, H. S. FAWCETT (*California Sta. Bul. 262* (*1915*), *pp. 153–192, 200–202, 207–210, figs. 23*).—The author compares the citrus diseases of Florida and California, having been connected with the experiment stations of each State for a number of years. Notes are also given of diseases observed in Cuba and the Isle of Pines during a visit to those islands.

The most widely distributed and probably the most serious citrus diseases of Florida are citrus canker, melanose (with its associated disease, stem-end rot), exanthema, withertip, and foot rot. Of secondary importance are scab, nail-head rust, psorosis, Diplodia gumming, blight, and mottled leaf. In California the most important diseases are brown rot gummosis (with its associated disease, brown rot of the fruit), mottled leaf, psorosis, and Armillaria root rot, with foot rot, withertip, exanthema, Botrytis gummosis of lemons, and Botrytis and Sclerotinia rots of lemons occupying a less important position. The characteristics of the different diseases are described, and in a table the diseases, parts affected, occurrence, and treatment are summarized.

[Citrus diseases at San Pedro in 1915], F. S. EARLE and J. M. ROGERS (*San Pedro* [*Isle of Pines*] *Citrus Path. Lab. Ann. Rpt., 1* (*1915*), *pp. 5–11, 21–41, figs. 16; abs. in Agr. News* [*Barbados*], *14* (*1915*), *No. 350, p. 318*).—Diseases referred to environment are chlorosis, ascribed in this locality to superfluous soil moisture or inferior nutrition; frenching, thought to be due here chiefly to killing of the root hairs by the sun's heat in unprotected soil, and alleviated by the use of a heavy mulch and a small amount of sodium nitrate; and rarely, Florida dieback in young groves, ascribed in part to unfavorable soil conditions.

Diseases here classed as functional or physiological are fruit gummosis, associated with chlorosis, causing some of the fruit to fall prematurely; blossom-end rot of limes and lemons, from which no organism could be isolated; spotting of the fruit, especially lemons, during artificial curing, and originating presumably in the breaking down of the oil cells; spotting of grapefruit, associated with insect injury; splitting of fruit, due here to heavy rains after the fruit ripens; leaf spotting of citrus trees which are below normal as regards growth conditions or which lack fertilizer; yellow spotting of leaves on unthrifty trees due to loss of root hairs and rootlets following continued rains; and greasy spot with accompanying leaf fall, not very serious, but of undetermined causation.

An alga causing a red rust on citrus trees, assigned to the genus Cephaleuros or Mycoidea, is said to be very similar to that causing red rust of tea in India.

Fungus diseases noted include a scab (*Cladosporium citri*) of fruit and young branches; sooty mold (*Fumago citri*); a smoky fungus somewhat similar; anthracnose or withertip (*Colletotrichum glœosporioides*); Rolf's Sclerotium fungus; blue molds (*Penicillium* spp.), usually more serious on lemons and oranges than on grapefruit; black molds (*Mucor* spp.); Fusarium root rot, traveling up the trunk and causing gummosis of the trees situated on wet, sandy land; and *Diplodia natalensis*, considered the worst citrus enemy in this section, and discussed at some length. The Diplodia is thought to be self-limiting by its production of gum, which, when present in sufficient amount, was found to check the development of the fungus. Painting with carbolineum or an emulsion thereof is the only preventive suggested. The washing tank is thought to be an important source of Diplodia infection of the fruit.

Citrus canker, III, H. E. STEVENS (*Florida Sta. Bul. 128* (*1915*), *pp. 20, figs. 6*).—In continuation of observations on citrus canker (E. S. R., 32, p. 345), the author gives an account of the history of the disease, its distribution in Florida, a description of its effect on the host plant, the cause of the disease, and laboratory investigations on the organism, *Pseudomonas citri,* in which its growth in sterilized soil and the effects of high temperature and drying out were noted.

In the laboratory experiments, soil was sterilized, inoculated with cultures of the bacteria, and kept under observation for six months, at the end of which period the bacteria were found alive and active. The organism was found to sustain high temperatures and drying out, which is believed to be an additional factor in spreading the disease.

Prompt and complete destruction of all infected trees is considered the only practical method of control, and since the bacteria are capable of living and growing in unsterilized soil for a long period, it is thought dangerous to plant citrus trees on land where the canker has been found.

A powdery mildew on citrus, C. N. CARTER (*Phytopathology, 5* (*1915*), *No. 3, pp. 193–196, pl. 1, fig. 1*).—The occurrence of a powdery mildew on the Dancy tangerine in southern California is reported. The fungus so far has been found only in a limited area, and is restricted to this tangerine.

The author believes this to be the first report of this type on citrus plants. The name *Oidium tingitanium* n. sp. is proposed for this mildew, a technical description of which is given.

A bacterial disease of the mango, Bacillus mangiferæ n. sp., ETHEL M. DOIDGE (*Ann. Appl. Biol., 2* (*1915*), *No. 1, pp. 1–45, pls. 14, figs. 3; abs. in Agr. News* [*Barbados*], *14* (*1915*), *No. 349, p. 302*).—A disfiguring and rotting disease of mangoes is described as having caused much loss and alarm in South Africa in recent years. The causal organism, which is described as *B. mangiferæ* n. sp., is carried partly by water dripping from affected portions of the plant, but a more important carrier is found in air movements. Lignified tissues are not affected, but the organism invades parenchymatous tissues, wedging apart and killing the cells and causing dark, angular spots on the leaves. Other soft portions of the plant are also attacked. The symptoms are described as very characteristic.

The organism was not controlled by use of Bordeaux mixture, iron sulphid, or Hycol. The organism is described in detail, and a résumé is given of its salient characters.

Melaxuma of the walnut (Juglans regia), H. S. FAWCETT (*California Sta. Bul. 261* (*1915*), *pp. 131–148, figs. 5*).—A preliminary report is given of a disease of English walnuts in California, which has been under observation since 1913, and brief accounts of which have been previously noted (E. S. R., 34, p. 56).

This disease, which is given its name on account of the black sap excreted, causes black cankers on the trunk, crotches, and large limbs, and occasionally the wilting of small branches. Experiments have shown that the cankers, as well as the wilting of the branches, are caused by the fungus *Dothiorella gregaria,* which has been isolated, grown in pure cultures, and found to produce the typical symptoms of the disease. In addition to the walnut, the fungus has been found on a species of willow (*Salix lasiolepis*), from which it is thought to have spread to walnut trees.

Experiments have shown that the disease may be successfully controlled by cutting out the cankers and the dead and badly diseased limbs, and disinfecting the cuts. On account of the willow acting as a host of the fungus, it is recommended that all willows near walnut orchards be cut back.

Notes on some diseases of trees in our National Forests, V, G. G. Hedgcock (*Phytopathology, 5 (1915), No. 3, pp. 175–181*).—In continuation of notes on forest tree diseases (E. S. R., 31, p. 845), the author describes the attacks and distribution of Razoumofskya and Phoradendron on different species of forest trees.

Insects as carriers of the chestnut blight fungus, R. A. Studhalter and A. G. Ruggles (*Penn. Dept. Forestry Bul. 12 (1915), pp. 33, pls. 4*).—This is a detailed account of the investigations carried on jointly by the Office of Forest Pathology of the Bureau of Plant Industry of this Department and the Pennsylvania Chestnut Tree Blight Commission, a preliminary report of which has already been noted (E. S. R., 31, p. 451).

In addition to the previous account, the authors state that 19 out of 52 insects, representing the orders Hemiptera, Coleoptera, Diptera, and Hymenoptera, were found carrying the spores. From the development of the colonies in cultures it appeared that insects from the field were carrying pycnospores almost exclusively.

A bibliography is given.

A honeycomb heart rot of oaks caused by Stereum subpileatum, W. H. Long (*U. S. Dept. Agr., Jour. Agr. Research, 5 (1915), No. 10, pp. 421–428, pl. 1*).—In a previous publication (E. S. R., 30, p. 52), the author described some fungi causing rots of oaks in different parts of the United States. In the present paper, an account is given of a rot to which the name honeycomb heart rot is given, due to *S. subpileatum*, which is said to be similar to but distinct from the rot caused by *S. frustulosum*.

Fourteen or more species of Quercus and possibly *Liquidambar styraciflua* are known to be attacked by this fungus, which is rather widely distributed, as indicated by the collections examined. Trees of all ages seem to be subject to the attack if they are old enough to have formed heartwood.

The only method of control seems to be prevention of infection. This can be done by eliminating forest fires, which cause wounds on the tree, and preventing the formation of the fruiting bodies of the fungus. As the fungus continues to grow in a tree after it is felled, all cull logs and tree tops should be destroyed to prevent the formation of sporophores.

A new scarlet oak disease, D. C. Babcock (*Phytopathology, 5 (1915), No. 3, p. 197*).—A brief note is given on a serious killing of young branches of scarlet oak in the vicinity of Cincinnati, which is believed to be due to attacks of a species of Botryodiplodia.

A new Macrophoma on galls of Populus trichocarpa, E. E. Hubert (*Phytopathology, 5 (1915), No. 3, pp. 182–185, figs. 3*).—In the fall of 1909, a collection of galls occurring on *P. trichocarpa* was made on the supposition that they were caused by an insect. Upon examination, there was no evidence of insect origin. Later other collections were made for study, and the trouble was found to be due to a fungus which is described by C. L. Shear as *M. tumefaciens* n. sp.

The galls, with the accompanying fungus, are said to have been widely distributed in Montana, a number of collections having been made in that State and in Idaho.

Pink disease of plantation rubber, F. T. Brooks and A. Sharples (*Ann. Appl. Biol., 2 (1915), No. 1, pp. 58–80, pls. 2, figs. 11*).—Work previously reported (E. S. R., 33, p. 151) has been followed up with more detailed investigation, and the chief results thereof are given.

The distribution, hosts, and mode of action of pink disease are discussed, as are the forms of the causal organism (*Corticium salmonicolor*), its action on the wood being described in detail. The formation of tyloses is considered as a response to the presence of the fungus in the wood. Pure cultures of the

fungus have been established on salep agar and on Hevea wood, and inoculation experiments with natural material and with that from pure cultures have been successful.

Spraying is not recommended except in particular cases, the most effective measure being removal of infected branches, or treatment of these portions with tar.

ECONOMIC ZOOLOGY—ENTOMOLOGY.

Revision of the pocket gophers of the genus Thomomys, V. BAILEY (*U. S. Dept. Agr., Bur. Biol. Survey North American Fauna No. 39 (1915), pp. 136, pls. 8, figs. 10*).—This paper completes the technical revision of the pocket gophers of the family Geomyidæ, the first part of which, prepared by Merriam, has been previously noted (E. S. R., 6, p. 787). The revision supplies definite information regarding the status and geographical distribution of the several forms. The pocket gophers are found to be of considerable economic importance, their tunneling resulting in damage to crops, young trees, irrigation ditch banks, etc.

The genus is said to include 88 recognizable forms of 40 species.

Notes on the progress of economic entomology, L. O. HOWARD (*Jour. Econ. Ent., 8 (1915), No. 1, pp. 113–119; Proc. Soc. Prom. Agr. Sci., 35 (1914), pp. 95–101*).

Insecticides, H. M. LEFROY (*Ann. Appl. Biol., 1 (1915), No. 3–4, pp. 280–298, fig. 1*).—A discussion of the present use of insecticides, the manner in which they act, etc.

Insecticides from a chemical standpoint, W. F. COOPER and W. H. NUTTALL (*Ann. Appl. Biol., 1 (1915), No. 3–4, pp. 273–279*).—A critical review of the subject.

The principal insect pests of Florida and California compared, H. S. FAWCETT (*California Sta. Bul. 262 (1915), pp. 193–199, 203–206, fig. 1*).—A brief comparison is made of the more important citrus insects of Florida and California. A table comparing citrus insect pests of California, Florida, and Cuba is included (pp. 203–206).

A preliminary list of the insects of the Province of Quebec, I–II (*Ann. Rpt. Quebec Soc. Protec. Plants [etc.], 4 (1911–12), Sup., pp. 103, figs. 19; 7 (1914–15), pp. 108–159*).—Part 1 of this work by A. F. Winn lists the Lepidoptera, and part 2 by A. F. Winn and G. Beaulieu the Diptera.

The effect of the injuries to summer-sown crops by the frit fly and by Adia genitalis on the growth and yield of the plants, N. V. ANDREEVA and I. V. KURDIUMOV (*Trudy Pervago Vseross. S̄ezda Dieiatel. Prikl. Ent., Kiev, 1913, pp. 25–36; abs. in Rev. Appl. Ent., 3 (1915), Ser. A, No. 5, pp. 230–232*).—A report of investigations conducted at the Poltava Experiment Station during the summer of 1913.

Effects produced by sucking insects and red spider upon potato foliage, A. S. HORNE and H. M. LEFROY (*Ann. Appl. Biol., 1 (1915), No. 3–4, pp. 370–386, pls. 5*).—This is a report of a series of experiments conducted with a view to determining accurately what effects are produced in potato foliage by sucking insects.

"Definite and similar symptoms apart from any other cause were obtained as the result of infesting young plants raised from seed of the President variety of potato with red spider, Aleyrodes, aphis, jassid, and capsid under various experimental conditions."

Notes on the insect enemies of Sudan grass, W. NEWELL (*Jour. Econ. Ent., 8 (1915), No. 2, pp. 230–234*).—Substantially noted from another source (E. S. R., 33, p. 746).

Sunflower insects, T. D. A. Cockerell (*Canad. Ent., 47 (1915), No. 9, pp. 280–282*).—Further notes on the insects of Helianthus, an account of which has been previously noted (E. S. R., 31, p. 548).

The biology of the juniper berry insects with descriptions of new species, S. Marcovitch (*Ann. Ent. Soc. Amer., 8 (1915), No. 2, pp. 163–188, figs. 63*).—During the course of investigations at Ithaca, N. Y., and at Minneapolis, Minn., of the insects attacking *Juniperus virginiana*, the author has found a number of insects to develop in these berries, including a tineid (*Argyresthia alternatella*) which eats the seeds, a trypetid (*Rhagoletis juniperinus* n. sp.) which feeds on the fleshy portion of the berry, and a cecidomyiid; and a mite, determined as *Eriophyes quadrisetus.* He has also reared six chalcidids, at least two of which are plant feeding in habit, namely, *Eurytoma juniperinus* n. sp., a description of which is here presented, and *Geniocerus juniperi.*. A parasitic larva found in contact with a Geniocerus larva has been determined as *G. marcovitchi. A. alternatella* has a number of enemies including a blue chalcidid (*Secodella* sp.), *Protapantales* sp., and parasites of the family Encyrtidæ.

A list of nine titles relating to the subject is included.

Control of grasshoppers in Imperial Valley, W. E. Packard (*California Sta. Circ. 143 (1915), pp. 11, figs. 8*).—A description is given of the more practical measures for combating grasshoppers.

Potato curly leaf caused by Euthrips occidentalis, D. L. Crawford (*Mo. Bul. Com. Hort. Cal., 4 (1915), No. 8, pp. 389–391, figs. 2*).—In the San Gabriel region of California the attack of potato plants by *E. occidentalis* has resulted in considerable injury to the crop.

The feeding of this thrips on the lower surface of the expanding leaf buds and young leaves causes the leaves to become crinkled and curly and usually much dwarfed. The attack on the older leaves does not cause curling but only spotting where the injury has been the worst. It is said to be very common to see early blight (*Macrosporium solani*) killing parts or the whole of some leaves injured by the thrips, and it is estimated that 75 per cent of the early blight in such fields is on the curly plants. "The dwarfing of the plants is severe as sometimes they are only one-tenth normal size; the leaves are much smaller and very often more or less blighted. The yield of tubers is seriously reduced, averaging perhaps one-fifth to one-third as many as on normal plants. The loss caused is great, when it is considered that in an average field at least one-eighth to one-fourth of the plants are seriously dwarfed, thus reducing the crop several hundred pounds per acre."

While curly leaf has been known in this region for two or three years it has not heretofore been as serious as during the season of 1915, and but little attention has been given to its control. The application of Bordeaux mixture by several growers for early blight is said to have resulted in a considerable reduction in the number of thrips. The author recommends that a tobacco extract such as blackleaf 40 be added to Bordeaux mixture at the rate of 1 pint to 100 gal. of Bordeaux, or to water alone, and applied as a control measure for the thrips not later than one month after planting. It will also help much, both for blight and curly leaf, to spray a second time with the same combination of Bordeaux and tobacco extract, about three weeks later.

The pea thrips (Kakothrips robustus), C. B. Williams (*Ann. Appl. Biol., 1 (1915), No. 3–4, pp. 222–246, figs. 12*).—A detailed report of studies conducted by the author in Great Britain, where, as in western Europe, *K. robustus* is the source of damage to peas and beans.

"The adults appear from May to August; males only in the earlier part. The eggs are laid chiefly in the tissue of the stamen sheath. They hatch in

about 9 days. The larvæ are orange-yellow with the last two abdominal segments dark brown. There is one molt. The second stage when full fed (about 24 days from the laying of the egg) descends into the ground to a depth of from 3 to 12 in. The full fed larvæ remains in this position till the following spring when the two pupal stages are passed through and the adult emerges. There is only one brood each year.

"The damage is greatest on light soils. No varieties are immune, but early sown plants are less damaged. A chalcid parasite (*Thripoctenus brui*) has been recorded from France, but has not been found in England. Artificial control is difficult. Spraying is only of use when the larvæ are feeding openly on large pods. Soil fumigation during the winter should give good results, but must be done to a sufficient depth."

A bibliography of 30 titles is included.

The harlequin cabbage bug, F. B. PADDOCK (*Texas Sta. Bul. 179 (1915), pp. 3–9, fig. 1*).—A popular account with control measures for this enemy of cruciferous plants which is present in almost every garden or field in Texas in which cabbage is grown. Attention is called to the fact that its original home was probably in Central America and Mexico, from which it has spread northward and is now known to occur to a limited extent as far north as Delaware, Maryland, Indiana, and Colorado.

The rhododendron lace bug (Leptobyrsa explanata), C. R. CROSBY and C. H. HADLEY, JR. (*Jour. Econ. Ent., 8 (1915), No .4, pp. 409–414, pl. 1, figs. 6*).—An account of the life history of this insect, together with technical descriptions of its stages.

Although the leaves of rhododendron are disfigured on the underside along the midrib by brownish scabs which cover the eggs, the greatest injury is caused by the nymphs and adults feeding on the undersurface of the leaf, causing a lighter colored spattered appearance of the upper surface, often with consequent drying and shriveling of the leaves. This insect may be killed by using soap and water spray at the rate of 1 lb. of soap to 10 gal. of water.

The immature stages of the black apple leafhopper (Idiocerus provancheri), M. D. LEONARD (*Jour. Econ. Ent., 8 (1915), No. 4, pp. 415–419, figs. 6*).—A brief account of the occurrence and biology of *I. provancheri*, together with technical descriptions of its several stages. The feeding of the nymphs on the leaves results in a yellow stippling similar to that caused by the apple leafhopper.

The apple sucker, with notes on the pear sucker, P. R. AWATI (*Ann. Appl. Biol., 1 (1915), No. 3–4, pp. 247–272, pls. 2, figs. 21*).—This is a report of anatomical and biological studies of *Psylla mali* conducted at Acton Lodge, Brentford, during the summer of 1913, together with notes on the pear sucker (*P. pyricola*), and means for the control of these insects.

Progress of the Sicilian mealy bug parasite, H. S. SMITH (*Mo. Bul. Com. Hort. Cal., 4 (1915), No. 11, pp. 525–527, fig. 1*).—A new chalcidid parasite of the citrus mealy bug described by Girault, as noted on page 456, as *Paraleptomastix abnormis*, and introduced into California from Palermo, Sicily, as previously reported by Viereck (E. S. R., 33, p. 658), has been thoroughly colonized in those portions of the State where the citrus mealy bug is abundant. Up to the time of writing 40,000 individuals had been colonized.

White fly at Marysville, G. P. WELDON (*Mo. Bul. Com. Hort. Cal., 4 (1915), No. 8, pp. 386–388, fig. 1*).—Eradication of the citrus white fly (*Aleyrodes citri*) at Marysville, Cal., has been demonstrated to be impossible under present conditions. Spraying experiments conducted with a view to keeping it under control have shown that this can be done through the application of miscible oil,

6 per cent strength, during the winter or early spring. Fumigation has been demonstrated to be a positive control measure. Since neither fruit nor trees are shipped from Marysville there seems to be little danger of the pest spreading to other sections.

The life history and habits of the greenhouse white fly (Aleyrodes vaporariorum), E. HARGREAVES (*Ann. Appl. Biol., 1 (1915), No. 3-4, pp. 303-334, figs. 56*).—A report of anatomical and biological studies of this pest, an extended study of which by Morrill has been previously noted (E. S. R., 15, p. 382).

The occurrence of fungi on Aleyrodes vaporariorum in Britain, A. S. HORNE (*Ann. Appl. Biol., 2 (1915), No. 1, pp. 109-111*).—This article relates to the association of *Cephalosporium lefroyi* with the greenhouse white fly.

Notes on an apparent relation between aphids and fire blight (Bacillus amylovorus), J. H. MERRILL (*Jour. Econ. Ent., 8 (1915), No. 4, pp. 402, 403*).—The data presented indicate that there is a direct relation between the severity of the infestation of aphidids and blight infection.

The turnip louse, F. B. PADDOCK (*Texas Sta. Bul. 180 (1915), pp. 7-77, pls. 5, figs. 10*).—Investigations commenced in the early fall of 1913 led to the discovery that the plant louse which has caused much of the widespread injury to turnips and related plants is not the cabbage aphis as supposed, but a distinct species, which has been described by Davis (E. S. R., 31, p. 754) as *Aphis pseudobrassicæ*, and which the author has termed the turnip louse.

The investigations have shown the turnip louse to be a serious pest in the winter truck regions of the State and to be generally distributed over the United States, especially where the cabbage aphis is found. It feeds upon many of the same plants, especially cultivated species, and for the most part on the undersurface of the tender leaves of the host plants, which include the turnip, radish, cabbage, mustard, cauliflower, kale, ruta-baga, lettuce, bean, rape, kohl-rabi, and collard.

Life history studies with descriptions of forms are reported in detail, much of the data being presented in tabular form.

"The normal form of reproduction of the turnip louse in Texas is asexual throughout the year. Observations have been made upon this louse in Texas from Brownsville, on the twenty-sixth parallel, to Wichita Falls, on the thirty-fourth parallel. True hibernation does not take place in Texas; even at the northernmost point of occurrence the lice reproduce some during the winter. The summer is the critical period in the life history of the turnip louse, as it is forced to sheltered locations and none of the cultivated host plants are grown at that time of the year. Thirty-five generations of the lice were reared in pot cages in one year. Two other species of plant lice are often found closely associated with the turnip louse. These are the 'garden aphis' and the cabbage aphis.

"The natural factors of control of the turnip louse are widespread over the State. Two species of parasites, *Diæretus rapæ* and *Lysiphlebus testaceipes*, have been commonly found, the former at College Station and the latter in other sections. Three species of lady beetles have been observed to feed freely on the turnip louse. These are *Hippodamia convergens*, *Megilla maculata*, and *Coccinella munda*. Syrphid flies and lace-wing flies are usually found in limited numbers where the turnip lice are abundant. A fungus disease was very destructive to the turnip louse during the season of 1914 at College Station.

"For the artificial control of the turnip louse, spraying is the most satisfactory method. Of the materials which can be used for spraying, laundry soap solution gives as satisfactory results as any and is easily obtainable. The

secret of success in the control of the turnip louse is the use of the 45° elbow and an 'angle' type spray nozzle. By the use of these it is possible to direct the spray on the undersides of the leaves, where the lice feed. The preventive measures against the turnip louse are rotation, proper planting time, trap crops, clean culture, and the destruction of the first colonies."

Little-known western plant lice, I, W. M. DAVIDSON (*Jour. Econ. Ent., 8 (1915), No. 4, pp. 419–429, pl. 1, figs. 25*).—Notes and technical descriptions are presented on *Phylloxera salicola, P. popularia, Thecabius populicaulis, Prociphilus fraxini-dipetalæ, Euceraphis gillettei* n. sp., *Eucallipterus flavus, Myzocallis pasaniæ* n. sp., and *Macrosiphum heucheræ*.

Notes on a scale insect attacking cacao in Uganda, C. C. GOWDEY (*Ann. Appl. Biol., 1 (1915), No. 3–4, pp. 399–402, fig. 1*).—*Stictococcus dimorphus* is said to be an important pest in Uganda through its infestation of the pods and the stems of the pods of cacao. Results of spraying experiments conducted led to the recommendation that whale-oil soap or soft soap kerosene emulsion be applied.

The butterflies of Australia, G. A. WATERHOUSE and G. LYELL (*Sydney: Angus & Robertson, Ltd., 1914, pp. VI+262, pls. 44, figs. 48*).—A monograph of the Australian Rhopalocera, introducing a complete scheme of structural classification and giving descriptions and illustrations of all the butterflies found in Australia, including a number now recorded for the first time.

Notes on three species of Heliophila which injure cereal and forage crops at Brownsville, Texas, R. A. VICKERY (*Jour. Econ. Ent., 8 (1915), No. 4, pp. 389–392*).—Three species of this genus have been found to injure cereal and forage crops in southern Texas, namely, *Heliophila subpunctata, H. unipuncta*, and *H. multilinea*.

A key to the cutworms affecting tobacco, S. E. CRUMB (*Jour. Econ. Ent., 8 (1915), No. 4, pp. 392–396, figs. 12*).—A table is presented, accompanied by illustrations of cutworm structures, for the identification of the cutworms known to affect tobacco in the United States.

The mosquitoes of North and Central America and the West Indies, L. O. HOWARD, H. G. DYAR, and F. KNAB (*Carnegie Inst. Washington Pub. 159 (1915), vol. 3, pt. 1, pp. VI+523*).—This, the first of two parts of volume 3 of the work previously noted (E. S. R., 29, p. 357), consists of systematic descriptions of the mosquitoes of North America, Central America, and the West Indies. Accounts of the genera and species are preceded by a historical sketch of the classification of mosquitoes, an outline of the geographical area covered, a statement of some of the characters used in the tables, etc. Under each species the authors give the synonymy, the original description, descriptions of the male, female, and larva when known, the distribution, and what is known of the life history and habits.

Some pioneers in mosquito sanitation and other mosquito work, L. O. HOWARD (*Pop. Sci. Mo., 87 (1915), Nos. 1, pp. 65–77, figs. 12; 2, pp. 169–180, figs. 12*).—This discussion, which is supplementary to the work on mosquitoes above noted, presents half-tones and brief accounts of 24 of the more prominent workers in this field.

An attempt to measure the local and seasonal abundance of the swede midge in parts of Yorkshire over the years 1912 to 1914, F. W. DRY (*Ann. Appl. Biol., 2 (1915), No. 1, pp. 81–108, pl. 1, figs. 7*).—The author found the swede midge to be present in 1912, 1913, and 1914, both at Garforth in the West Riding of Yorkshire and in all parts of the area in which he worked in the East Riding.

Chortophila trichodactyla, a hitherto unknown enemy of young cucumber plants in lower Silesia, O. OBERSTEIN (*Ztschr. Pflanzenkrank., 24 (1914), No. 7, pp. 385–388; abs. in Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases, 6 (1915), No. 3, p. 478*).—Some 80 per cent of the cucumber plants in a half acre field at Lampersdorf from which specimens were sent were infested with this dipteran.

[Injury to corn by the frit fly], T. SHTCHERBAKOV (*Viestnik Russ. Selsk. Khoz., No. 43 (1914), pp. 10–12; Iuzh. Russ. Selsk. Khoz. Gaz., No. 46 (1914), pp. 8, 9; abs. in Rev. Apl. Ent., 3 (1915), Ser. A, Nos. 2, p. 98; 3, pp. 148, 149*).—A report of observations of injury to corn by the frit fly (*Oscinis frit*) at the Shatilov Agricultural Experiment Station in 1914. This is said to be the first record of its attack upon corn.

Experiments in controlling larvæ of Melolontha by means of carbon bisulphid, E. V. ZVIEREZOMB-ZUBKOVSKY (*Abs. in Rev. Appl. Ent., 3 (1915), Ser. A, No. 5, pp. 228, 229*).—A report upon experiments with *Melolontha melolontha* and *M. hippocastani* conducted in the nursery of the Vasilkovsk forest, of the Government of Kief.

Digging operations undertaken in various parts of the nursery showed an average presence of 16 larvæ in about 5.5 sq. ft., while in the adjoining woods only 2 or 3 larvæ were found in the same area. A total of 191 larvæ were collected in 12 holes, each 28 by 28 by 28 in. The diggings showed that at the beginning of May the larvæ were more or less equally distributed over various depths, in the middle of May they predominated at a depth of 14 in., and after the end of May at a depth of 7 in. At the beginning of August single pupæ were found at a depth of 16 to 19 in.

In the experimental introduction of carbon bisulphid into the soil by means of an injector it was found that a dose of 4 gm. injected to a depth of 3 or 4 in. produced only 8 per cent of stupefied larvæ; the same amount injected to a depth of 5 or 6 in. produced 15 per cent, while 5 to 7 gm. injected to a depth of 6 or 7 in. destroyed all the larvæ, 35 gm. being sufficient for an area of 5.5 sq. ft. The stupefied larvæ died in 1 or 2 days. In addition to larvæ of Melolontha, larvæ of *Anomala aenea*, of *Phyllopertha horticola*, and of some other Scarabæidæ were found.

The dried-fruit beetle (Carpophilus [Scarabæus] hemipterus), E. O. ESSIG (*Jour. Econ. Ent., 8 (1915), No. 4, pp. 396–400, figs. 4*).—This beetle is a source of some anxiety to fruit growers and considerable worry to fruit packers and grocers throughout California.

Honeybees: Wintering, yields, imports, and exports of honey, S. A. JONES (*U. S. Dept. Agr. Bul. 325 (1915), pp. 12*).—The data here presented are based upon returns from about 650 honey producers in 42 States, covering 80,000 colonies of bees.

The Texas foul brood law, B. YOUNGBLOOD (*Texas Sta. Circ. 8, n. ser. (1915), pp. 3–9*).—The text is given of the foul brood law, which became effective in June, 1914.

A revision of the North American ichneumon flies of the subfamily Opiinæ, A. B. GAHAN (*Proc. U. S. Nat. Museum, 49 (1915), pp. 63–95, pls. 2*).—This revision includes a bibliography of the genera of Opiinæ and their synonymy, and keys to the genera and to the species of Opius. Fifty-seven species are recognized, all but two of which belong to the genus Opius, of which 19 are described as new to science.

Among the new species are *Opius mandibularis* from an agromyzid in leaves of chrysanthemum at Washington, D. C.; *O. foersteri*, parasitic on *Eulia triferana* (=*Lophoderus incertana*) at Kirkwood, Mo.; and *O. gracillariæ*, reared from *Gracillaria desmodiella* at Kirkwood, Mo.

Lists of North American species unknown to the author and of species wrongly classified as Opiinæ are included. The genus Allobracon of which *Diachasma pilosipes* is the genotype is characterized.

Species of Opiinæ have been recorded as parasitic on dipterous, coleopterous, and lepidopterous insects, the usual hosts being phytophagous Diptera of the families Agromyzidæ, Trypetidæ, Anthomyidæ, and related families. Observations of Silvestri (E. S. R., 31, p. 455) and the author indicate that the eggs are deposited in or upon the host larva in one of its immature stages. In all instances observed the host larva completed its development and assumed the pupal stage before being killed by the parasite.

Biology of Apanteles militaris, D. G. Tower (*U. S. Dept. Agr., Jour. Agr. Research, 5 (1915), No. 12, pp. 495–508, pl. 1, fig. 1*).—A report of studies commenced in September, 1914, in which particular attention has been given to a description of the life stages of this braconid endoparasite of the army worm.

In observations extending from the last of September to the last of October the total length of the life cycle averaged 25 days. The time spent by the third instar and pupa in the cocoon varied from 5 to 7 days during the first two weeks of August as compared with 11 and 12 days during September and October. In oviposition observations it was found that one-sixth of the apparent depositions in the larvæ of the third stage, one-fifth of those in the fourth, and one-half of those in the fifth were unsuccessful. The parasite larvæ usually emerge after the caterpillar is full grown. From 56 to 113 cocoons were collected from single hosts in the field under natural conditions. Observations show that the species is parthenogenetic, and that unfertilized females give rise to a generation of males.

It is stated that the army worm has been found to pass the winter at Nashville, Tenn., as young larvæ, and that specimens under observation have been parasitized in the fall, the parasites completing their growth and emerging the following spring. Attention is called to the fact that Gibson (E. S. R., 27, p. 659) found the army worm to winter in Canada as young larvæ beneath tufts of grass. "Considering the data at hand, the theory is advanced that in the North the parasites winter as partly developed forms in immature larvæ, while in the South they no doubt also winter while in the cocoon."

The paper concludes with notes on the origin and function of the caudal vesicle.

A bibliography of 9 titles is appended.

Two scoliid parasites on scarabæid larvæ in Barbados, W. Nowell (*Ann. Appl. Biol., 2 (1915), No. 1, pp. 46–57, pl. 1, fig. 1*).—During the course of investigations of the root grubs of sugar cane the author has found *Tiphia parallela* to attack *Phytalus smithi*, some 30 per cent of grubs and cocoons discovered during extensive digging having been parasitized. An examination of the ovary tubes of the parasite seems to indicate an egg capacity of at least 70. Five to 6 days are said to be required for the development of the egg, which is laid in a fold of the dorsum of the thorax. A chart record of Tiphia larvæ shows 11 or 12 days to be required for their development, with the completion of which they spin up, for which about 24 hours are required. The time spent in the cocoon, as observed in the insectary, is usually from 32 to 40 days.

The second scoliid, (*Dielis*) *Campsomeris dorsata*, a species found in Barbados throughout the year, has been discovered to parasitize Ligyrus grubs. The development is said to be very similar to that of Tiphia. A rhipiphorid, identified as *Macrosiagon octomaculatus*, is said to have several times been found to emerge from cocoons of a Campsomeris, and is taken on flowers of *Antigonon leptopus* frequented by Campsomeris.

The destruction of (Diaspis) Aulacaspis pentagona by means of Prospaltella berlesei, A. BERLESE (*Redia, 10 (1915), No. 1–2, pp. 151–218; abs. in Internat. Inst. Agr.* [*Rome*], *Mo. Bul. Agr. Intel. and Plant Diseases, 6 (1915), No. 3, p. 476*).—A brief discussion of the mulberry scale and its natural enemies in Italy is followed by a somewhat detailed account of the establishment and dispersion of the parasite *P. berlesei,* which has proved to be effective in controlling this important pest. Earlier accounts of *P. berlesei* have been noted (E. S. R., 32, p. 755).

A bibliography of ten pages relating to the subject is appended.

Descriptions of new species of Hymenoptera, S. A. ROHWER (*Proc. U. S. Nat. Mus., 49 (1915), pp. 205–249*).—This article contains descriptions of 47 new species of Hymenoptera with notes on certain other species and genera. Many of the species are of economic importance with regard to forest trees, some of them being important parasites, while others are defoliators.

Among the new species of economic importance are the following: A tenthredinid, *Croesus castaneæ,* the larvæ of which feed gregariously on the leaves of *Castanea dentata,* at Falls Church, Va.; several ichneumonids, namely, *Pezoporus* (*Schenkia*) *tenthredinarum* reared from a sawfly leaf miner on cherry (*Profenusa collares*) at Geneva, N. Y.; *Lagarotis virginianus* and *L. diprioni,* both primary parasites of *Diprion lecontei,* and *Homalomma pteronideæ,* a primary parasite of *Pteronidea corylus,* all at Falls Church, Va.; *Exenterus diprioni,* a primary parasite of *D. lecontei,* at Tomahawk Lake, Wis.; *Moerophora neoclyti,* parasitic on *Neoclytis capraea* in *Quercus arizonica* in Arizona; *Amersibia prionoxysti,* a primary parasite on Prionoxystus in chestnut at Falls Church, Va.; *Scambus evetrivorus,* a parasite on *Evetria buschnelli* infesting *Pinus ponderosa,* at Fort Bayard, N. Mex.; and the following braconids: *Apanteles* (*Apanteles*) *sibinidis,* a parasite of *Sibine stimulea, A. phobetri,* a parasite of *Phobethron pithecium,* and *Gnamptodon nepticulæ,* a primary parasite on *Nepticula castaneæfoliella,* all at Falls Church, Va.; *Bassus coleophoræ* and *Microbracon coleophoræ,* both parasitic on *Coleophora leucochrysella* feeding on chestnut, the former at Charter Oak, Pa., and the latter at Falls Church, Va.; and *Microbracon hemimenæ* reared from *Hemimena plummerana,* Plummers Island, Md.

The spread of Prospaltella berlesei in Piedmont in 1914, P. VOGLINO and M. SAVELLI (*Abs. in Rev. Appl. Ent., 3 (1915), Ser. A, No. 5, p. 251*).—Inspections made in Piedmont from mid-September, 1914, to early in January, 1915, to determine the intensity of parasitism of the mulberry or West Indian peach scale (*Aulacaspis* [*Diaspis*] *pentagona*) by *P. berlesei* showed that the scale has been largely destroyed in some localities.

Biosteres rhagoletis sp. n., a parasite of Rhagoletis pomonella, W. C. WOODS (*Canad. Ent., 47 (1915), No. 9, pp. 293–295, pl. 1*).—Notes relating to the rearing of a braconid parasite of the apple maggot infesting blueberries in Washington County, Me., are accompanied by a description by E. A. Richmond of the parasite under the name of *B. rhagoletis.* The parasite has since been reared by Severin from puparia of the apple maggot obtained from the wild crab or cultivated apples at Orono, Me.

Four new encyrtids from Sicily and the Philippines, A. A. GIRAULT (*Entomologist, 48 (1915), No. 627, pp. 184–186*).—Two of the species here described, namely, *Paraleptomastix abnormis* and *Epidinocarsis pseudococci,* were reared from *Pseudococcus citri* from Sicily.

Cherry and hawthorn sawfly leaf miner, P. J. PARROTT and B. B. FULTON (*U. S. Dept. Agr., Jour. Agr. Research, 5 (1915), No. 12, pp. 519–528, pl. 1*).—The occurrence of *Profenusa collaris* in New York State and its injury to the cherry (*Prunus* spp.) first came to the attention of the New York State Station in June,

1910. An examination of the orchard from which this sawfly leaf miner had been collected showed that more or less of the leaves on nearly all of the trees of the English Morello cherry had shriveled and died, others with well-defined light-colored areas or blisters revealing a loss of chlorophyll.

In addition to the cherry the hawthorn serves as a host plant. Of the cherries, it has so far largely confined its attacks to the English Morello variety. In its attacks on hawthorns the leaf miner tunnels the foliage in the same manner as in the cherry. The authors' observations indicate that the insect is more destructive to certain species of Cratægus than to the cherry. As a cherry pest the leaf miner is definitely known to occur in injurious numbers in orchards of English Morello cherry about Geneva in western New York and about Germantown in the Hudson Valley. A study of the literature has failed to reveal any record of its occurrence as a cherry pest outside of New York State. As a depredator of hawthorns it has a wider distribution, being known as a serious pest about Boston, Mass., and as common on various species of Cratægus growing in the vicinity of New York City, Rochester, Ithaca, Geneva, and Skaneateles.

Technical descriptions are given of its life stages. The sawflies make their appearance as the first leaf clusters are unfolding and the cluster buds are beginning to open. Oviposition commences soon after emergence from the ground, which in 1913 was first observed on May 6. In examinations for the location of the point of deposition of the eggs, it was found that they are more often deposited near the base of the leaf than the tip. From 1 to 5 eggs were observed on a single leaf and the average for all observations was 2.3 eggs per leaf. In 1913 young larvæ were first observed on May 24, as the trees were coming into full bloom, and by May 27 the hatching period was practically completed. Eggs deposited on cherry leaves in the insectary hatched in 8 days. Upon hatching out the young larva works its way through the tissue of the leaf until it reaches the upper epidermis, usually mining toward the distal end of the leaf. Upon reaching maturity the larvæ make a hole in the tissues forming the mine and escape to the edge of the leaf, thence to the ground. In 1912 the larvæ began to leave the foliage on June 7 and by June 10 it was estimated that 50 per cent had abandoned their mines.

The chalcidid egg parasite *Trichogramma minutum* is said to be a common enemy of this leaf miner, the parasitism in 1915 ranging from 40 to 90 per cent on individual trees. An ichneumonid parasite reared from *P. collaris* is described by Rohwer (see p. 456) as *Pezoporus tenthredinarum.* As regards control measures it is thought that picking the affected leaves will prove most effective and economical in controlling this insect. The removal and destruction of all mined leaves, coupled with the practice of destroying wild hawthorns in the immediate vicinity of a cherry orchard, should leave few opportunities for the pest to develop to injurious numbers. Of the various measures employing insecticides to protect cherry foliage from the work of the leaf miner, fumigation with hydrocyanic acid gas alone was effective. The authors state, however, that it should only be undertaken as an extreme measure and in an experimental way under expert direction. It is pointed out that fall or early spring plowing or cultivation may be of value in destroying the larvæ in the soil. In the protection of hawthorns in decorative plantings the practice of spraying seems to be preferable, the most satisfactory results having been obtained from the use of nicotin at the rate of 1 pint (40 per cent solution) to 100 gal. of water to which 4 lbs. of soap has been addded. This should be used in liberal amounts and applied with rather high pressures at the time when the insects first begin to mine the foliage.

Fumigation method for sacked cotton seed, W. E. HINDS (*Jour. Econ. Ent., 8 (1915), No. 4, pp. 400–402, pl. 1*).—The author describes a method of fumigating cotton seed with carbon disulphid that has been worked out in Alabama. With this method it has been found possible, with four men to do the work, to treat 600 or more sacks per day.

The Acarina or mites: A review of the group for the use of economic entomologists, N. BANKS (*U. S. Dept. Agr. Rpt. 108 (1915), pp. 153, figs. 294*).—The work previously noted (E. S. R., 17, p. 882) has been revised and enlarged and brought up to date. Many new illustrations have been added.

Two introduced worms of economic interest, H. GARMAN (*Jour. Econ. Ent., 8 (1915), No. 4, pp. 403, 404*).—The author records the occurrence of *Bipalium kewense* in a greenhouse at Lexington, Ky., and of *Heterodera schachtii* at Spreckles, Cal., where it is a destructive pest of sugar beets.

Some feeding habits of slugs, MARIE V. LEBOUR (*Ann. Appl. Biol., 1 (1915), No. 3–4, pp. 393–395*).—The author reports upon studies of the habits and food of two species of slugs (*Agriolimax agrestis* and *Arion circumscriptus*), made during the course of an investigation of the broad tapeworm of lambs (*Moniezia expansa*) at the University of Birmingham. Both of the slugs appear to be fond of Moniezia, and also of *Cittotænia pectinata* which infests rabbits in that vicinity. The author failed to find evidence that either of the two slugs acts as intermediate hosts for *M. expansa* or *C. pectinata.*

The chromosome cycle in Coccidia and gregarines, C. DOBELL and A. P. JAMESON (*Proc. Roy. Soc.* [*London*], *Ser. B, 89 (1915), No. B 610, pp. 83–94, figs. 2*).—The work here reported has been carried on with the coccidian *Aggregata eberthi* and the gregarine *Diplocystis schneideri.*

Careful investigation of these two organisms is said to have shown that the nuclear divisions at all stages in the life histories are mitotic, and that the chromosome numbers are remarkably constant. The life history of this coccidian comprises a sexual generation which takes place in the body of a cuttle-fish (*Sepia officinalis*) and an asexual generation in the body of a crab (*Portunus depurator*). The life history of *D. schneideri* is passed in a single host, a cockroach, having been studied chiefly in *Periplaneta americana*, but was also found in *Stylopyga orientalis.*

FOODS—HUMAN NUTRITION.

Household chemistry, H. T. VULTÉ (*Easton, Pa.: The Chemical Publishing Co., 1915 pp. VI+233*).—This book is intended as a text-book for students in home economics, in secondary schools, or in colleges, and considers the principles of chemistry as they apply to and are illustrated in the household. Among the subjects considered are the chemistry and physics of air as related to ventilation; the chemistry of water, metals, glass, pottery, etc.; and the chemistry of foods, to which considerable attention is given. Chapters are also devoted to the consideration of methods of disinfection and the chemistry of soaps and other cleaning agents. The elementary principles of volumetric and gravimetric analysis, as they apply to household chemistry, are outlined very briefly.

Index to reports on food products and drugs of the Connecticut Agricultural Experiment Station, 1896–1914, J. P. STREET (*Connecticut State Sta. Bul. 187 (1915), pp. 94*).—The object of this index is to collect in one publication all the references to the food and drug work of the station. This work covers a more or less complete analysis of about 26,000 samples of foods, and the examination of about 3,000 samples of drug products to detect adulterations or variation from required standards.

The use of the blood of slaughtered animals as human food, F. HOFMEISTER (*München. Med. Wchnschr., 62 (1915), Nos. 33, pp. 1105–1108; 34, pp. 1146–1150*).—A summary and digest of data considering in detail the nutritional and economic value of blood for food purposes. Analytical data are given showing the composition of food which consisted in part of purified blood preparations. Baking experiments are also reported in which bread made with 20 per cent of dried blood is said to have possessed excellent qualities.

The value of blood in human nutrition and the behavior of formaldehyde in the organism, E. SALKOWSKI (*Biochem. Ztschr., 71 (1915), No. 4–5, pp. 365–390*).—In this article the author discusses the protein content of blood in comparison with that of meat, the utilization and metabolic behavior of blood eaten as food, and its preservation by antiseptic agents. Feeding experiments are described in which laboratory animals (dogs) received as a part of a mixed diet blood preparations containing formaldehyde. The following conclusions are drawn:

The blood of beef has nearly the same protein content as the best fat-free beef flesh, and is of equal nutritive value. The blood can be preserved for several weeks by the use of boric acid, salicylic acid, or formaldehyde; it can be used directly, with the addition of a large percentage of sugar, for food purposes. Coagulated blood protein may be preserved for longer periods of time; this may be used directly in the preparation of food.

The addition of from 0.6 to 1 gm. of formaldehyde daily to the food of a dog of 12 kg. body weight produced no apparent disturbances in nutrition, and the protein of the ration was well utilized. Only about 0.6 per cent of the formaldehyde appeared in the urine, the rest being oxidized in the body. On the basis of these observations the author considers that the toxicity of formaldehyde taken internally has been overestimated.

Fish poisoning by bacteria of the paratyphosus-enteritidis group, R. MÜLLER (*München. Med. Wchnschr., 61 (1914), No. 9, pp. 471–473, figs. 7; abs. in Hyg. Rundschau, 25 (1915), No. 16, p. 606*).—Following a number of cases of fish poisoning, bacteriological examination revealed the presence of organisms of the paratyphosus-enteritidis group. Feeding experiments with laboratory animals (mice) strengthened the conclusion that the poisoning was due to these organisms.

The action of the digestive ferments on the so-called fish poison, S. W. KONSTANNSOFF and E. O. MANOILOFF (*Wiener Klin. Wchnschr., 27 (1914), No. 25, pp. 883–886*).—Experiments in vitro are reported in which were determined the chemical properties of several different proteins by means of a study of the effects produced upon them by the action of pepsin, trypsin, and erepsin. Fish poison (a substance extracted from poisonous fishes) was broken down by the action of pepsin and trypsin, but was not digested by erepsin; hence, it is believed to be a complex protein. The conclusion is drawn that this substance acts as a poison only when the digestive juices present are insufficient to accomplish the digestion of complex proteins.

Dried milk preparations, H. KÜHL (*Hyg. Rundschau, 25 (1915), No. 19, pp. 693–696*).—The author points out in this article that dried milk tablets and powder, when used by the soldier without ample facilities for cooking, are an unsatisfactory substitute for whole milk. Due to chemical changes which have taken place in the fat and protein, the solubility of these preparations is said to decrease rapidly with age.

The food value of different types of bread, A. PUGLIESE (*Rev. Gén. Sci., 26 (1915), No. 21, pp. 612–617, figs. 3*).—Feeding experiments with six Italian laborers are reported. These were undertaken to determine the effect on the nutritive value and physiological properties of flour of incorporating in it vary-

ing amounts of the bran of wheat. The experimental periods were of five days' duration and continued for a month. The flour used was 75, 80, and 85 per cent bolted, and in one case a mixture of wheat flour and corn meal was tested. These flours were made up into bread which formed a part of a simple mixed diet.

The author concludes from the experimental data that bran is not a useful food for man. The bread from flour 85 per cent bolted produced intestinal disturbances and a considerable loss of protein to the body. Flour 80 per cent bolted, however, was found to possess a food value superior to that 75 per cent bolted. Regarding the contention that a loss of bran constitutes a loss of vitamins, it is held that this matter is of minor importance in that the heat of baking may be sufficient to destroy these substances, and that, moreover, a sufficient quantity of vitamins is always supplied by any well-selected mixed diet.

The preparation of porous bread from starch, W. Ostwald and A. Riedel (*Kolloid Ztschr., 17 (1915), No. 1, pp. 12–14, figs. 5*).—Baking tests with potato and tapioca starch are described.

In the absence of wheat flour, the dough proved too inelastic to hold the gas developed from baking powder or yeast and did not make a porous loaf. It was found, however, that by mixing the dough made with starch and yeast, or starch and baking powder, with a stiff starch paste (30 per cent starch) to the extent of 15 per cent of the total weight, a satisfactory loaf with a good crumb could be obtained.

The use of rice in bread making, N. Novelli (*Gior. Risicolt., 5 (1915), No. 5, pp. 68–72*).—Experiments in bread making are reported in which 20 per cent of rice flour was added to the wheat flour. Only the chaff was removed from the rice, the superficial layers of the mesocarp which are rich in nitrogen being included in the rice flour. The analysis of white bread made from wheat flour alone was as follows: Water, 27.8; ash, 0.85; protein, 10; fat, 0.28; crude fiber, 0.37; and nitrogen-free extract, 60.7 per cent. That made from 80 per cent of wheat flour plus 20 per cent of rice flour was water, 27.7; ash, 0.9; protein, 9.87; fat, 0.25; crude fiber, 0.32; and nitrogen-free extract, 60.96 per cent.

The banana and its by-products, E. Collin (*Ann. Falsif., 8 (1915), No. 83–84, pp. 280–291, figs. 6*).—The microscopical features of the banana and banana flour are herein described, and information is given regarding the chemical composition of the green and mature fruit and of banana flour.

Maple sugar, A. McGill (*Lab. Inland Rev. Dept. Canada Bul. 324 (1915), pp. 25*).—Analytical data are given regarding 234 samples of maple sugar, of which 204 were found to be genuine.

Micro-organisms in dried fruits and vegetables (*Konserv. Ztg., 16 (1915), No. 40, p. 157*).—This article constitutes a preliminary report of work on the microbiology of dried fruits and vegetables. Dried apples, prunes, apricots, cherries, and vegetables were examined, and in nearly every test the number of organisms present was very small. Yeasts, but practically no bacteria, were found in the fruits.

Electric bake ovens at Salt Lake City, B. W. Mendenhall (*Jour. Electricity, 36 (1916), No. 2, p. 37, fig. 1*).—This article gives information regarding the installation and the consumption of electricity of baking ovens in a number of bakeries and cafeterias.

Feeding and metabolism of infants, L. Langstein and L. F. Meyer (*Säuglingsernährung und Säuglingsstoffwechsel. Wiesbaden: J. F. Bergmann, 1914, 2. and 3. ed., rev. and enl., pp. XII+408, figs. 46*).—This volume, intended as an outline for the practicing physician, is a revision and enlargement of the pre-

vious edition, and is designed to bring the subject-matter into accord with the results of recent clinical and experimental observations. It discusses the chemical and physiological aspects of the various constituents of infant diet during metabolism, including energy transformations; the physiological development of normal infants; the nutrition of breast-fed infants, and their nutritional disorders; artificial feeding; mixed feeding and weaning; feeding the newly born and the prematurely born; and the various diseases to which infants are liable. There is included a table showing the energy value per 100 gm. of the more important types of natural and modified milk and milk substitutes commonly prescribed by German physicians.

A chemical study of woman's milk, especially its inorganic constituents, L. E. Holt, Angelia M. Courtney, and Helen L. Fales (*Amer. Jour. Diseases Children, 10* (*1915*), *No. 4, pp. 229–248*).—The authors report the results of an investigation of the composition of the ash in woman's milk at the different periods of lactation. In most cases the entire 24 hours' secretion was examined; 32 individual samples and 6 composite samples—all from apparently healthy women with healthy children—were taken. The conclusions are summarized as follows:

"The use of large individual samples of milk for analyses has advantages not offered by such small ones as have been commonly employed. For a determination of the inorganic constituents large samples are indispensable.

"In the colostrum period woman's milk has high protein and high ash with rather low fat; in the transition period the protein and ash are lower while the fat is higher; in the mature period (after one month) the composition of normal milk does not vary in any essential or constant way quite up to the end of lactation. The only striking feature of late milk is a decline in quantity, though there is noted a slight fall in all the solid constituents except the sugar.

"Of the different constituents of milk the least variation both in individuals and in periods is seen in the sugar. The proportion of this is somewhat higher than the generally accepted 7 per cent; 7.5 per cent is nearer the correct figure.

"The greatest individual variations are seen in the fat, though the period variations in fat are not marked.

"The protein is highest in the colostrum period and falls to a little over half the proportion in mature milk, during which period it is seldom over 1.25 per cent; of this about one-third is casein, and two-thirds lactalbumin.

"The high ash of the colostrum period is chiefly due to the amount of Na_2O and K_2O. Of the salts which make up the ash, the greatest individual, as well as the greatest period, variations are seen in the Na_2O; the least individual and period variations are seen in the CaO, the proportion of which is nearly constant throughout the period of lactation. The largest constituent of the ash of woman's milk is K_2O; this with the CaO together make up more than half the total ash.

"Although in amount the total ash of cow's milk is about three and one-half times as great as that of woman's milk, the proportion of different salts which make up the ash is nearly the same, the only exception being that cow's milk has more P_2O_5 and less iron."

Studies in infant metabolism and nutrition.—V, The composition and preparation of protein milk (Eiweissmilch), L. E. Holt, D. D. Van Slyke, Angelia M. Courtney, and Helen L. Fales (*Amer. Jour. Diseases Children, 10* (*1915*), *No. 3, pp. 172–182*).—This report describes in detail a method for the preparation of a protein milk which has given very satisfactory results in cases of infantile indigestion. The composition of the milk when prepared according to the method described by the authors is given as fat, 3 to 3.5 per cent; sugar, 1.8 to 2; protein, 3.6 to 4; ash, 0.65.

Nutrition and metabolism of an infant fed on artificial food, E. HELLESEN (*Nord. Med. Arch., Inn. Med., 48 (1915), No. 3–4, [pp. 1–121]; abs. in Jour. Amer. Med. Assoc., 65 (1915), No. 6, p. 566*).—This paper records the results of an extensive study of the metabolism of a healthy infant five months old.

The data reported confirm the view that carbohydrates spare the carbon and nitrogen reserves better than fat, and that carbohydrate food directly affects the mineral metabolism, especially that of sodium. The conclusion is drawn that carbohydrates and fats, therefore, can not substitute each other indiscriminately—that each has its specific action in metabolism as a whole, and that this is an important factor in regulating their use as food.

A standard dietary for an orphanage, ADELE S. JAFFA (*[Sacramento, Cal.]: State Printing Office, 1915, 2. ed., p. 37*).—The earlier edition of this bulletin has been noted (E. S. R., 33, p. 365).

The relation of heat to summer diarrheas of infants, A. BLEYER (*Jour. Amer. Med. Assoc., 65 (1915), No. 25, pp. 2161–2163, figs. 4*).—Clinical observations are reported of 222 infants who had developed acute attacks of diarrhea. A direct relation was found to exist between the degree of temperature and the disease, "over half (51.4 per cent) of the babies becoming ill on days when the temperature was 90, although there were but 31 per cent of such days in the two summers.

"The observations were made among babies of the poor, among whom diarrheas in summer are very prone to occur. Most of them were rationally fed, usually on some mixture of certified milk when breast milk was not available. It was especially interesting to find that 30 of them (13 per cent) were exclusively breast-fed, and that 22 more were partially breast-fed, which is evidence that heat may very well influence the baby who is taking clean food."

It was found that the majority of babies were overburdened with clothing and suffered from lack of cleanliness.

Recent contributions to the knowledge of beri-beri, H. SCHAUMANN (*Arch. Schiffs u. Tropen Hyg., 19 (1915), Nos. 15, pp. 393–418; 16, pp. 425–445*).—Recent investigations of various phases of the beri-beri question are summarized in this paper. An extended bibliography is appended.

Beri-beri in the Amazon basin, A. M. WALCOTT (*Jour. Amer. Med. Assoc., 65 (1915), No. 25, pp. 2145–2147*).—This paper reports data regarding the occurrence and dietetic treatment of beri-beri in Brazil. The conclusion is drawn that beri-beri in Brazil is the same as that found elsewhere and is caused by the lack of some essential element in the food. It has been treated successfully by so modifying the diet as to increase the amounts of meat, eggs, milk, legumes, and fresh fruits.

Studies in diabetes.—I, Theory of diabetes, with consideration of the probable mechanism of antiketogenesis and the cause of acidosis, A. I. RINGER (*Jour. Biol. Chem., 17 (1914), No. 2, pp. 107–119*).—The author discusses in this article the theory of antiketogenesis. Structural formulæ form a part of the summary and digest of data, and equations are given to show how the addition of glucose to a restricted carbohydrate diet, as in starvation or a fat-protein diet, prevents the formation of incompletely oxidized end products, the presence of which is taken to denote acidosis.

He concludes that the means by which carbohydrates are able to minimize an existing acidosis and to prevent its formation in normal individuals is a chemical reaction by which incompletely oxidized end products, such as β-hydroxybutyric acid, etc., combine with glucose to give glucosids instead of ketone bodies. The immediate cause of acidosis, therefore, may be due to the absence of glucose and consequently to the failure of the individual to accomplish this glucosid union.

Studies of pellagra (*Jour. Amer. Med. Assoc., 65 (1915), No. 21, pp. 1818, 1819*).—This article summarizes in a concise form the results of recent investigation into the cause of pellagra.

Contribution to the physiology of the stomach.—XXI, The secretion of gastric juice in man, A. J. CARLSON (*Amer. Jour. Physiol., 37 (1915), No. 1, pp. 50–73, fig. 1*).—Observations are reported of the amount and character of gastric juice secreted under varying conditions by a man having a gastric fistula and complete cicatricial stenosis. The author's conclusions are as follows:

"The fluid content of the 'empty' stomach varies from 8 to 50 cc. with an average of 20 cc. The quantity is greater in the morning than at noon or at 6 p. m. It is on the whole greater in the summer than in the winter months. The most important factor in these daily and seasonal variations is probably the tonicity of the empty stomach.

"The gastric glands in the normal person are never completely quiescent. The continuous secretion varies from 2 to 50 cc. per hour. The higher figures are exceptional, but may obtain for several days in succession, again to revert to the lower figures. The vagus secretory tonus is a possible, and the autodigestion of the gastric juice itself is a probable, factor in this continuous gastric secretion. The secretion itself is rich in pepsin, but when the secretion rate is very low it is poor in hydrochloric acid.

"Chewing of indifferent substances and stimulation of the nerve endings in the mouth by substances not related to food do not cause secretion of gastric juice, that is, these processes do not augment the continuous gastric secretion.

"Seeing, smelling, and possibly thinking of palatable food usually cause a slight, but very transitory secretion of gastric juice.

"The rate of secretion of gastric juice on mastication of palatable food is directly proportional to the palatability of the food. During mastication the average rate is 3.5 cc. per minute (minimum rate, 1.4 cc.; maximum rate, 10.8 cc.). On cessation of chewing the secretion rate diminishes rapidly so that from 15 to 20 minutes the gastric glands reach the level of the continuous gastric secretion. The chemistry of this appetite gastric juice has been practically constant during the three years of observation.

"The latent period of the appetite secretion varies indirectly with the rate of the continuous secretion, so that when the continuous secretion is abundant the appetite secretion shows no latent period at all, while with the lowest rate of the continuous secretion the latent period varies from 2 to 4 minutes. This latent period is therefore one of the processes of secretion in the gland cells, and not in the nervous mechanism.

"On the basis of these experiments on Mr. V., on the reports of other gastric fistula cases in man, and on the work of Pawlow on dogs, it is estimated that an adult normal person secretes at an average meal (dinner) 700 cc. gastric juice, or an average total of 1,500 cc. gastric juice in 24 hours."

A study of the action of bitter tonics on gastric secretion has been noted from another source (E. S. R., 32, p. 858).

On the secretion of bile, S. OKADA (*Jour. Physiol., 49 (1915), No. 6, pp. 457–482*).—The experiments herein reported were made with dogs, which were provided with a permanent fistulous opening, so that the total secretion of bile passed out by the fistula. A number of tests were conducted to determine the effect of diets of bread, butter, and meat on the quantity of bile secreted. Other experiments concerned the effect of protein, carbohydrate, and fat administered in the form of white of egg, cane sugar, and olive oil, respectively. Tests were also made with peptone, extract of meat, acids, drugs, etc. The author's conclusions are, in part, as follows:

"There is little difference in the effects on the secretion of bile during the first six or seven hours between the diets of bread, butter, and meat, if these substances be administered in quantities of corresponding caloric value. In the case of bread the diminution in secretion occurs sooner than in the case of butter or meat.

"Starvation tends to diminish the secretion of bile and the excitatory effect of feeding on the liver cells.

"The following substances introduced into the stomach cause an increased secretion of bile: Raw white of egg (if digestion occurs), boiled egg white, fat and oil, soap solution, acids (very marked), Witte's peptone, Liebig's extract of meat, and bile salts, or bile. . . .

"The following substances eaten or introduced into the stomach produce little or no effect: Pure cane sugar, cakes of baked starch and sugar, water, and a solution of sodium bicarbonate."

The influence of temperature and humidity in closed rooms on the human organism, K. HINTZE (*Ztschr. Hyg. u. Infektionskrank., 80 (1915), No. 2, pp. 171–183*).—A large number of experiments are reported in which was studied the effect of high temperature and humidity upon the human body. In more than half of the tests the temperature was over 30° C. (86° F.), and in some cases it was as high as 40°, with a humidity of 50–60 per cent. At the lower temperature a humidity of from 70–90 per cent was tried, and at 20–30° the air was saturated.

With two or three exceptions the subjects endured the high temperature and humidity very easily, and no particular ill effects were experienced.

ANIMAL PRODUCTION.

Genetic studies on a cavy species cross, J. A. DETLEFSEN (*Carnegie Inst. Washington Pub. 205 (1914), pp. 134, pls. 10*).—This paper is based on a study of the wild Brazilian guinea pig (*Cavia rufescens*), the common domestic guinea pig (*C. porcellus*), hybrids between these, and subsequent progeny obtained in the next eight generations by various matings. About 1,800 animals, wild or hybrid, entered in one way or another into experiments on color, growth, size, and fertility. Besides these, approximately 600 guinea pigs, living under the same conditions in collateral experiments, served as a basis for necessary comparisons.

In part 1, which deals with color and coat characteristics, the following general conclusions are reached: "*C. rufescens* is homozygous in agouti, black, brown, the extension factor, smooth coat, uniformity, intensity, and short hair. Hybrids of any color variety can be produced by mating it to the guinea pig. The color and coat characters of *C. rufescens* are dominant in every case, except as regards roughness and texture of coat and possibly the agouti factor. The hybrids have the zygotic color formula which one would expect to obtain by mating a pure agouti strain of guinea pigs to some other color variety of guinea pigs. The agouti of hybrids, though always epistatic to the nonagouti condition of the same, is subject to modification as a result of the cross. This modified wild agouti is very distinct from the tame agouti and is recessive to it. The two segregate clearly in the F_2 generation. Both are allelomorphic to each other and to their absence. Hybrids were produced homozygous in agouti, yet bearing the wild and the tame agouti. Roughness derived from the tame guinea pig is very imperfectly dominant over the smooth wild coat. This incomplete dominance is lost in later, more dilute, wild-blooded generations, and the rough coat becomes normally dominant. The uniform coat of the wild is dominant to the spotted coat of the tame.

In later generations the hybrids show the incomplete dominance of uniformity over spotting, which is characteristic of the guinea pig. Any color variety known in guinea pigs can be produced in the hybrids. Combinations of tame and wild characters can be made, even bringing in such a morphological character as polydactylism from a tame race, together with the peculiar agouti of the wild race. The inheritance of coat and color characters throughout this species cross is in accordance with Mendel's law. It is equally true of matings of hybrids inter se and of matings of hybrids of either sex with guinea pigs."

In part 2, which deals with growth and morphological characters, the following general conclusions were reached: "The wild *C. rufescens* used in these crosses were about half as large as the guinea pigs *C. porcellus*. They were not only less in weight, but their bones were also shorter and more slender. The one-half wild hybrids were usually heavier at all ages, had larger skeletal dimensions, and gave every indication of being more vigorous than either parent species. The one-quarter wild hybrids lacked this vigor, for they were smaller than the one-half wild hybrids in every way. They were very nearly the equal of the guinea pig in average size and skeletal dimensions. Possibly the males were a little smaller than the guinea pig. The one-eighth wild hybrids averaged about the same as the guinea pig in weight and skeletal dimensions. Two black crosses were sufficient to render the F_3 hybrids and guinea pigs practically indistinguishable in size and skeletal dimensions. The number of adult wild available was too small to give a satisfactory index of their variability. The same was true of the one-half wild hybrids. The guinea pigs were remarkably uniform. The variability of all hybrids in both sexes was very low and gave no clear indication of segregation. The M-shaped nasal-frontal suture of the wild appeared to be dominant. Crossing back to the tame species gave a wide range of variability in the F_2, F_3, and F_4 generations. The truncate nasal-frontal suture of the tame species was recovered in the F_2 generation or one-quarter wild, but did not breed true. The differences in skull shape between the wild and tame were blended in the F_1 generation. In later generations all traces of the pointed, wild skull shape were gradually lost. The deep narrow indentation on the outer surface of the last upper molar, almost separating the small third lobe from the body of the tooth, was reduced in the F_1 generation; and all traces of it were lost in later generations. The taxonomists lay great stress on this character. There was no apparent effect of sterility on size in the male hybrids. The unusual frequency of an interparietal bone, the occurrence of a 5-toed individual, and other anomalies were observed in the hybrids but not in the guinea pig."

In part 3, which deals with the fertility of parent species and hybrids, it was found that "crosses between *C. rufescens* males and *C. porcellus* females gave completely sterile male hybrids and fertile female hybrids. By crossing the female hybrids back to guinea pig males, one-quarter wild hybrids were obtained, which were again sterile males and fertile females. A few males of this second hybrid generation, however, showed some degenerate nonmotile sperm. By repeated back crosses of female hybrids to guinea pigs, increasing signs of fertility appeared. Fertility seemed to act like a very complex recessive character; for the results obtained were what one would expect if a number of dominant factors for sterility were involved, the elimination of which would give a recessive fertile type. There was an enormous range of forms between hybrids with no sperm and fertile hybrids with many motile sperm. The results indicated that a completely fertile hybrid male could be bred to female hybrids or to guinea pigs, giving about the same results as a normal guinea pig male in such matings.

"The secondary sexual characters of all male hybrids were normally developed. The wild *C. rufescens* has a smaller litter average than the guinea pig. When the wild males were bred to guinea pig females, the size of the litters was that of the guinea pig. The female hybrids produced by this cross, however, gave a litter average intermediate between that of the wild and tame. By repeatedly crossing the hybrid females of one generation back to guinea pig males to produce the next hybrid generation, the litter average was raised almost to that of the guinea pig itself. This is all the more interesting since guinea pig males were used to raise the litter average. Two female hybrids showed some male secondary sexual characters. One of these with marked male instincts had abnormal ovaries. Abnormal ovaries were common in the female hybrids. The sex ratio in the hybrids showed a marked preponderance of females, especially in the early hybrid generations, i. e., in those generations which must have been most hybrid in constitution."

A bibliography of references is included.

Crossbreeding experiments with Himalaya and black×tan rabbits, V. HAECKER (*Mitt. Naturf. Gesell. Halle, 2 (1912), pp. 21–24*).—An account of crossbreeding experiments with rabbits in a study of color inheritance.

Rabbit crossing, II, V. HAECKER and OLGA KUTTNER (*Ztschr. Induktive Abstam. u. Vererbungslehre, 14 (1915), No. 2, pp. 49–70, pls. 3, fig. 1*).—This is a continuation of the work noted above.

The inheritance of black-eyed white spotting in mice, C. C. LITTLE (*Amer. Nat., 49 (1915), No. 588, pp. 727–740, figs. 8*).—The investigations indicated that spotting in mice is dependent upon more than one pair of clear-cut mendelizing factors. Modifying factors which may be more or less difficult to analyze but which nevertheless are certainly present contribute to the extent of variation in spotted races. "Spotting in rodents is tempting as genetic material because of the clear patterns and contrast between colored and white areas. It is, however, as a character extremely sensitive to minute quantitative and qualitative changes, and its apparent genetic simplicity is a snare and a delusion."

The zoological relationship between the banteng (Bibos sondaicus) and the zebu (Bos indicus), H. GANS (*Kühn Arch., 6 (1915), pt. 1, pp. 93–152, pls. 5*).—This reports studies made of banteng and zebu skeletons with a view to determining their physiological relationship. It is stated that there are three possibilities: (1) The banteng is the primary type from which the zebu has risen, the intermediate forms being dead or at least unknown; (2) the zebu is a cross between *Bos primigenius* and the banteng; and (3) the banteng, zebu, and *B. primigenius* have all sprung from the same primary type. The author considers the last hypothesis as being the most probable.

What is a breed? O. LLOYD-JONES (*Jour. Heredity, 6 (1915), No. 12, pp. 531–537, figs. 4*).—It is pointed out that the definition of the word "breed" varies with each kind of like stock, and is based almost wholly on the arbitrary decision of breeders. Various examples are given to demonstrate the truth of this statement. When a group of animals becomes sufficiently set off to be called by common consent a breed, a number of breeders unite themselves into an association. The breed is then definitely delimited, and from this time, but not before, can the term pure-bred be correctly and safely applied to individual specimens.

A new feeding stuff, by-product of household garbage (*Flour, Hay, Grain, and Feed, 28 (1915), No. 1, pp. 30, 31*).—The method of manufacturing a by-product of household garbage for use as a feeding stuff is described.

Ricinus poisoning, KOBERT (*Landw. Vers. Stat., 85 (1914), No. 3–4, pp. 176–191; abs. in Jour. Bd. Agr. [London], 22 (1915), No. 4, pp. 359–361*).—A discussion on poisoning by the seed of the castor oil plant.

The poisonous principle, ricin, is contained in the shelled seeds and not in the shell, capsule, or oil extracted from the kernel. Castor oil seeds may be introduced into feeding stuffs in various ways. The hedges of fields of peanuts and sesame in the Tropics are often of Ricinus plants, and the seeds may thus get mixed at harvest, as well as during transport and in storage. Large quantities of the shells are sold to manufacturers of compound feeding cakes, and it is estimated that at least 1 per cent of kernel matter may be present with the shell. This is an amount more than sufficient to cause fatal poisoning of cows with ordinary feeding.

As regards the toxic effects, immunity is reached by small and gradually increasing doses. In the blood serum of immunized animals "antiricin," which has the effect of an antitoxin, is formed.

Directions are given for the detection of ricin in feeding stuffs.

Fish meal adulterations with meat meal and their microscopic identification, R. Lucks (*Landw. Vers. Stat., 86 (1915), No. 5-6, pp. 289-322, pls. 8*).—Methods of detecting meat meal adulteration of fish meal are described.

Inspection of commercial feed stuffs, P. H. Smith, C. L. Beals, and J. T. Howard (*Massachusetts Sta. Control Ser. Bul. 3 (1915), pp. 4-70*).—Analyses are given of cotton-seed meal, linseed meal, peanut oil meal, sesame oil meal, gluten meal, gluten feed, distillers' dried grains, malt sprouts, brewers' dried grains, red dog flour, wheat middlings, wheat bran, molasses feed, corn meal, rye meal, hominy meal, ground oats, provender, dried beet pulp, meat scrap, bone meal, fish meal, alfalfa meal, cut clover, and various mixed and proprietary feeds. The various groups of feeding stuffs are discussed, and an article entitled Information of Interest to Dairymen, by J. B. Lindsey, is appended.

Commercial feeding stuffs, 1914-15, [and] Texas feed law, B. Youngblood (*Texas Sta. Bul. 177 (1915), pp. 5-279*).—Analyses are given of cotton-seed meal, cotton-seed cake, cold pressed cotton seed, milo maize chop, wheat shorts, wheat bran, corn chop, corn bran, ground oats, Kafir corn chop, alfalfa meal, peanut meal, dried molasses beet pulp, feterita chop, hominy feed, rice polish, rice bran, rice hulls, rice chop, meat scrap, meat meal, blood meal, tankage, and various mixed and proprietary feeds, with other useful data. The text of the law regulating the sale of feeding stuffs in Texas is appended.

Live stock of the farm, C. B. Jones et al. (*London: The Gresham Publishing Co., 1915, vols. 1, pp. X+254, pls. 40; 2, pp. VI+264, pls. 10, figs. 5*).—These volumes deal in a general way with the breeding, feeding, care, and management of beef and dairy cattle.

Cattle feeding, A. D. Faville (*Wyoming Sta. Bul. 108 (1915), pp. 29-42*).—Two lots of 6 steers each were fed 70 days, lot 1 receiving native hay and lot 2 native hay and oat and pea silage. These lots made average daily gains per head of 0.6 and 1.54 lbs., lot 1 requiring 41.67 lbs. of hay and lot 2, 9.74 lbs. of hay and 18.18 lbs. of silage per pound of gain. The cost per pound of gain was for lot 1 20.84 and for lot 2 8.51 cts. It is stated that in the appearance of the steers and in the rapidity and cost of gains lot 2 had all the advantage.

Two lots of 4 cows each were fed 140 days, lot 1 receiving alfalfa and oat and pea silage and lot 2 alfalfa alone. These lots made average weekly gains per head of 2.5 and 3.9 lbs., lot 1 consuming daily 10 lbs. of alfalfa and 15 lbs. of silage, and lot 2 21.8 lbs. of alfalfa, the daily cost of ration per cow being for lot 1, 9 cts., and for lot 2, 13 cts. Both rations met requirements very satisfactorily. While the silage fed did not quite replace the extra alfalfa, it made a good winter ration for breeding cows and effected a saving of 4 cts. per cow each day.

Two other lots of 4 heifers each were fed 140 days, lot 1 receiving grain, alfalfa, and oat and pea silage, and lot 2, grain and alfalfa. These lots made

average daily gains per head of 0.93 and 1.02 lbs., lot 1 requiring 1.95 lbs. of grain, 10.77 lbs. of alfalfa, and 10.77 lbs. of silage, and lot 2, 1.76 lbs. of grain and 17.62 lbs. of alfalfa per pound of gain. The cost per pound of gain was for lot 1, 11.05, and for lot 2, 12.77 cts., the daily cost of rations per heifer being 10.5 cts. and 13 cts., respectively.

In order to test the value of the oat and pea silage as completely as possible, 5 of the heifers were fed for 112 days reversible rations during 4-week periods. The total gain of 5 head on silage was 347 lbs., and of 5 head without silage 253 lbs. In the total daily gain for the 5 heifers 36 lbs. of silage and 22.5 lbs. of alfalfa were fed interchangeably, with gains considerably in favor of the silage.

Analyses of the feeds used are appended.

The structure of the wool of pure-bred wool-producing sheep and that of crosses with the kemp-producing race, H. Güldenpfennig (*Kühn Arch., 6 (1915), pt. 1, pp. 85–92, fig 1; abs. in Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases, 6 (1915), No. 10, pp. 1398–1400*).—In his studies the author found that as regards fineness of wool, mutton-producing Merinos are equal to the animals of the Electoral breed and their fleeces are twice as long. The Merino-Rambouillet and Merino-Dishley breeds have a fleece of the same length but their wool is coarser. Among the straight-wooled sheep, the East Friesian milk-producing breed, like the Lincoln, constitutes a special type. The former is distinguished in its particular group by the small amount of crimp and the smooth appearance of its wool, while the wool of the Lincoln sheep is long and fine with a greasy luster.

From the quality of their coat, the mixed wool and kemp-producing breeds can form a group apart, for which the rule may be formulated that the coarser the kemp the finer the wool. The very fine wool of the Somali breed has lost its fineness through crossing with other breeds. The determination of the proportion between the weight and the respective members of the kemp fibers and of wool fibers is deemed of great importance. When determined, it was seen in the offspring of crosses to have an intermediate value.

The consistency of the kemp fibers of wool varies considerably in different breeds and between one animal and another. The wool of Merino sheep has an average elasticity and a more uniform and perhaps greater resistance to strain than that of any other breed. The products of crossing give, even in this case, intermediate values. The elasticity coefficients of the wool of Merinos and their hybrids are approximately equal. The highest average coefficient is that of the smooth and the mixed wool breeds.

Value and use of green fodders in the feeding of hogs, N. Hansson (*Centralanst. Jordbruksförsök Flygbl., 50 (1915), pp. 4; Nord. Mejeri Tidn., 30 (1915), No. 26, pp. 305, 306*).—It is said that roots, potatoes, and alfalfa are being used to some extent as a hog feed in Sweden. The value of green feeds for hogs has been demonstrated by experiments in that country, it being found that from 7 to 7.5 kg. of alfalfa and green clover and from 9 to 10 kg. of coarser green feed were equal in value to 1 kg. of grain. The food value of these fodders was not increased by fermentation or boiling, although they made the feed more appetizing. It was found that the best results were obtained by increasing the amount of green fodder until the hog reached 70 to 86 kg. in weight and then gradually decreasing the green feed until the end of the fattening period. The gains of hogs fed in this way were greater than the gains of those not receiving the green feed, but the dressing percentage was less. The green feed had no influence on the quality of the meat.

Swine feeding, A. D. Faville (*Wyoming Sta. Bul. 107* (*1915*), *pp. 13–27*).—Three lots of 7 pigs each were fed 112 days a grain mixture of middlings and corn meal, 1:2, lot 1 in addition being hurdled on pea pasture, lot 2 on pea pasture but not hurdled, and lot 3 in the dry lot. These lots made average daily gains per head of 0.97, 0.8, and 0.79 lb., requiring 2.5, 3.02, and 6.15 lbs. of grain per pound of gain for the respective lots. It is estimated that 1 acre of hurdled pasture saved 1,897 lbs. of grain, while 1 acre of the pasture not hurdled saved 1,340 lbs.

At the close of this experiment all 3 lots were fed 56 days in the dry lot, and made average daily gains per head of 1.37, 1.28, and 1.04 lbs., requiring 4.94, 4.79, and 5.46 lbs. of grain per pound of gain for the respective lots. The better showing made by the first 2 lots is credited to the residual effect of the pasture, being for lot 1 278 lbs. and for lot 2 335 lbs., so that the total amounts to be credited to the pasture are 2,086 and 1,568 lbs. of grain saved by 1 acre of pasture. In this experiment 10 cross-bred and 11 pure-bred pigs were used, and both while on pasture and on dry feed the gains made by the two classes were practically the same.

Two lots of 4 37-lb. pigs each were fed for 168 days a grain mixture of corn meal and middlings, 1:1, the grain being mixed with water for lot 1 and with alfalfa tea for lot 2. These lots made average daily gains per head of 0.58 and 0.68 lb., requiring 5.57 and 4.78 lbs. of grain per pound of gain for the respective lots. It is suggested that a small amount of the alfalfa meal itself might have proved equally satisfactory. These pigs were then redivided into 2 lots of 4 pigs each and fed 56 days, lot 1, receiving corn meal and alfalfa meal, 4:1, and lot 2, barley meal and alfalfa meal, 4:1. These lots made average daily gains per head of 1.02 and 0.98 lbs., requiring 4.86 and 5 lbs. of grain per pound of gain for the respective lots.

Two lots of 3 brood sows each were fed 91 days, lot 1 receiving grain and alfalfa hay, and lot 2, grain and pea hay. These lots made average daily gains per head of 0.54 and 0.43 lb. Both lots made satisfactory gains and kept in good breeding condition. Five of these sows were then divided into 2 lots of 2 and 3 each and fed 42 days, lot 1 receiving corn meal alone, and lot 2, corn meal and alfalfa hay, 4:1. These lots made average daily gains of 2.9 and 2.1 lbs., respectively, lot 1 requiring 4.1 lbs. and lot 2 4.86 lbs. of grain per pound of gain.

Analyses of the feeds used are appended.

The story of three pigs, L. B. Burk (*Texas Sta. Circ. 9, n. ser.* (*1915*), *pp. 3–6*).—Three 62-day-old pigs were fed 6 months as follows: Pig 1, in a dry lot on milo chop soaked in water; pig 2, in a dry lot on milo chop and skimmed milk, the chop being soaked in the milk between feeds; pig 3, on pasture and milo chop soaked in skimmed milk between feeds. These pigs made total gains for the period of 94.5, 250, and 305.5 lbs. Although pig 1 was the largest at the beginning, during the first month he gained only 8.5 lbs., while pig 2 made more than four times as much gain, and pig 3 more than five times as much in the same length of time. Pig 1 made a consistently slow gain, but the other pigs made consistently rapid gains. It is thought that pig 1 was not able to supply his body with enough growing material for proper development from milo chop alone. It is estimated that pig 3 made a profit of $11.62; pig 2, $6.39; and pig 1, a loss of 22 cents.

Distribution of public service stallions in Wisconsin in 1915, A. S. Alexander (*Wisconsin Sta. Bul. 258* (*1915*), *pp. 3–67, figs. 3*).—It is stated that the horses of Wisconsin increased 27,000 in number and $147,000 in total value in

1915, but fell $5 in average price during the year, the average value now being $131. The percentage of pure-bred sires is increasing. Notable progress is reported in the quality of horses as the result of the enactment of the stallion law in 1906.

A directory of owners of public service stallions and jacks constitutes the bulk of the bulletin.

Farm poultry, M. A. Jull (*Quebec: Macdonald College, 1915, pp. 95, figs. 91*).—A practical treatise on the breeding, feeding, care, and management of poultry for market purposes. An article on external parasites of poultry by W. Lochhead is included.

Measurement of the winter cycle in the egg production of domestic fowl, R. Pearl (*U. S. Dept. Agr., Jour. Agr. Research, 5 (1915), No. 10, pp. 429–437*).—Continuing previous work (E. S. R., 31, 570), the author presents evidence from studies at the Maine Experiment Station tending to show that with flocks of poultry having average hatching dates falling somewhere within the month of April "the correlation between the egg production to March 1 of the pullet year as one variable and the egg production up to the time when the individual is 300 days of age as the second variable is extremely high. The mean production to March 1 is, in general, higher than the mean production to 300 days of age. The production to March 1 is a relatively less variable measure (as indicated by the coefficient of variation) than the production to 300 days of age.

"The conclusion that the 300-day production would be a better measure of the winter cycle of fecundity than the production to March 1 is not warranted by the facts. Whatever superiority there is of one of these measures over the other is entirely in favor of the production to March 1. The justification for the employment of the winter cycle of production as an index of innate fecundity capacity or ability is a distinct and separate problem which has been discussed at length in earlier papers."

A bibliography of literature cited is included.

Report of the third international egg-laying contest [from October 28, 1913, to September 27, 1914], J. R. Terry (*Brit. Columbia, Dept. Agr., Live Stock Branch, Rpt. Internat. Egg-Laying Contest, 3 (1914), pp. 28, figs. 11*).—An account of the egg production, cost of production, profits, and other items relating to the various breeds at this contest.

Process for the preservation of eggs, H. L. S. Loft (*English Patent 19,721, Sept. 12, 1914; abs. in Jour. Soc. Chem. Indus., 34 (1915), No. 20, p. 1068*).—"Eggs are placed in a closed vessel and subjected for two hours to the action of a mixture of air and formaldehyde at 35° C. [95° F.]; if desired, steam may also be admitted. The temperature is then lowered and maintained at 10° for 30 minutes, after which the eggs are coated with a suitable substance, e. g., melted paraffin wax."

DAIRY FARMING—DAIRYING.

Raising dairy heifers; Cost, feeding, and care, C. C. Hayden (*Ohio Sta. Bul. 289 (1915), pp. 30, figs. 5*).—Data for two years were collected on the cost of producing a dairy heifer at the station under Ohio conditions. The average birth weight of the Jerseys was 56 lbs. and that of the Holstein-Friesians 82 lbs. In records kept of 40 Jersey heifers and 29 Holstein-Friesian heifers from birth to 1 year of age it was found that the Jerseys made an average daily gain of 1.1 lbs. at a feed cost of $27.75 and a net total cost of $42.54. The Holstein-Friesians made a daily gain of 1.3 lbs. at a feed cost of $29.31 and a net total

cost of $44.10. It was found that the heifers receiving the largest amount of milk and the smallest amount of pasture were most expensive, thus emphasizing the fact that heifers born in the fall and normally fed cost less than those born in the spring, even though a normal amount of milk is fed to each.

The daily gain of the Jerseys for the second year was 0.8 lb., while that of the Holstein-Friesians was 1 lb. The net total cost for the second year was $36.01 and $38.44, respectively.

The average weight of the Jerseys at calving time (26½ months) was 822 lbs. and that of the Holstein-Friesians 1,076 lbs. The Jerseys calved an average of 2 weeks earlier than the Holstein-Friesians.

An effort was made to raise a calf which was not thrifty, considerable skimmed milk being fed after 1 year of age because of her condition. This heifer calved at 31 months of age, 4 months later than the average. She weighed 100 lbs. less than the average, gave birth to a deformed calf, and was of no value as a milker.

Summarizing the results of the two years' experiments it was found that the average cost for the first year was $43.32 and for the second year, $37.23; and from birth to calving at 26.5 months, $91.39. It is stated that these costs to 2 years of age and to calving are undoubtedly higher than the average for the State, and could have been reduced by breeding heifers to calve at 24 months of age or earlier, by feeding less, or by feeding inferior feeds. Any of these changes, however, would have made the heifers smaller and possibly inferior producers later.

Part 2 of this bulletin is a general discussion of methods of feeding, care, and management of calves and heifers, including calf diseases.

The value of dried yeast, potato refuse, malt sprouts, and palm-nut cake as feed material for milk production, and their specific influence on the fat content of the milk, W. Völtz, A. Baudrexel and W. Dietrich (*Landw. Jahrb., 47 (1914), No. 4, pp. 573–638*).—In feeding experiments with dairy cows it was found that the addition of the supplementary concentrated feeds yeast, potato refuse, malt sprouts, and palm-nut cake had practically equal effects on the yield of milk. On an average 1 lb. of dry matter increased the yield about 0.54 lb. in each case, and the fat content as follows: Palm-nut cake by 0.041 lb., yeast by 0.024 lb., and potato refuse by 0.006 lb. It was concluded that the rations being fed were already sufficiently rich in protein without these supplements.

Changes in the combination of rations and in the physiological conditions of the animals resulted in differences in the utilization of the foods exceeding 100 per cent. It was concluded that the determination of the relative milk-yielding capacity of cows during one or several periods of lactation can have only a limited value.

The effect of feeding on the composition of milk and butter: Linseed cake and hempseed cake, H. T. Cranfield and Margaret G. D. Taylor (*Analyst, 40 (1915), No. 475, pp. 433–439, figs. 2*).—In experiments with two lots of four cows each fed for eight weeks it was found that the composition and quality of milk and butter produced by feeding hempseed cake was practically equal to that obtained by feeding linseed cake. On one or two occasions the butter from the hempseed cake feeding was not quite so good as regards flavor and color, but in the majority of samples there was very little difference.

The removal of cows from poor pasture to a well-balanced ration in stall caused a decrease in the percentage of fat, a considerable rise in the Reichert-Meissl, Kirschner, and Polenske values, and a fall in the refractometer figure.

The effect produced upon the fatty matter of milk by a ration exclusively consisting of sugar beets, J. Boes and H. Weyland (*Ztschr. Untersuch. Nahr. u. Genussmtl., 29 (1915), No. 12, pp. 473–475; abs. in Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases, 6 (1915), No. 10, p. 1362*).—The authors analyzed a sample of butter coming from a farm where it had been necessary to feed the cows for a long time exclusively upon sugar beets. The butter was of normal color, but excessively hard and its taste was unpleasant. It was characterized by its small amount of ash, the great quantity of soluble volatile fatty acids, and the surprisingly large content of insoluble volatile fatty acids. The iodin value was very small. In spite of these characteristics, the butter was of about the same composition as that obtained by feeding cows on a mixture of beets and other foodstuffs.

Fat content of milk from heifers and cows, J. J. Hooper (*Breeder's Gaz., 68 (1915), No. 19, p. 808*).—It is stated that data contained in a booklet recently sent out by the Holstein-Friesian Association show that, from records of 634 cows on test, heifers apparently gave slightly richer milk than the mature cows. Cows 7 years 2 months of age produced milk averaging 3.52 per cent butter fat; cows 4 years 9 months, 3.5 per cent; cows 4 years 3 months, 3.51 per cent; cows 3 years 9 months, 3.78 per cent; cows 3 years 3 months, 3.54 per cent; cows 2 years 8 months, 3.55 per cent; and cows 2 years 2 months, 3.51 per cent.

The rate of the passage of fatty acid of food into the mammary glands of the goat, O. C. Bowes (*Jour. Biol. Chem., 22 (1915), No. 1, pp. 11–13*).—In this study peanut oil was fed to a goat. It was found that the time required for the ingested fatty acids to appear in the milk was never over 12.5 hours and generally less.

Breed origins of the dairy queens, J. B. Bain (*Hoard's Dairyman, 1915, Dec. 24, pp. 703–707, 730, 731, figs. 10*).—A general résumé of the history and development of the principal breeds, together with an account of the high-record cows of each breed.

[World's champion] (*Hoard's Dairyman, 50 (1915), No. 18, pp. 559, 560, figs. 7*).—An account of the Holstein cow Duchess Skylark Ormsby, which recently completed a year's record of 27,761 lbs. of milk and 1,205 lbs. of fat.

Some results of cow-test association work in New Hampshire, F. Rasmussen and W. P. Davis (*New Hampshire Col. Ext. Bul. 4 (1915), pp. 3–32*).—In connection with summaries of the work of a number of cow-test associations in New Hampshire it is pointed out that the averages of 747 cows show that the largest producers consumed the most feed and were the most profitable. Improvement in one herd numbering 205 cows and belonging to an association for four years shows an increase per cow in milk production of 1,077 lbs. of milk and 48.6 lbs. of butter fat, and an increase in profit of $22.35 per cow. Improvements in another herd for four years show an increase of 671 lbs. of milk and 45.9 lbs. of butter fat per cow, and an increase in profit of $23.01 per cow.

Data on the cost of keeping a cow are given.

The short-time fat test, O. E. Reed (*Hoard's Dairyman, 50 (1915), No. 18, p. 577*).—Data are presented tending to show that the short-time fat test, notably the 7-day test, is not reliable. One cow on official test for one week gave milk that showed a test of 4.18 per cent, although for the previous year her average test was only 3.42 per cent, while another cow, with a yearly test of 3.19 per cent, gave an official 7-day test of 4.04 per cent.

The National Dairy Council, H. B. Favill (*Hoard's Dairyman, 50 (1915), No. 17, pp. 535, 538*).—A presidential address delivered at the meeting of the

National Dairy Council, at Chicago, November 5, 1915, in which the purpose, work, and policy of the association are outlined.

Action of inspectors' association (*Cream. and Milk Plant Monthly, 4* (*1915*), *No. 3, pp. 11–23*).—An account of the fourth annual meeting of the International Association of Dairy and Milk Inspectors, held at Washington, D. C., in October, 1915, together with various papers read at the meeting. See also a previous note (E. S. R., 33, p. 701).

Analyses of frozen milks, L. Padé (*Ann. Falsif.*, *8* (*1915*), *No. 79–80, pp. 170–172*).—A number of analyses are reported of samples of milk which had been frozen and then partially melted. The portion melting first contained the largest percentage of fat, ash, and solids. This observation leads the author to conclude that, in order to prevent fraud in selling or distributing from large containers, partially frozen milk should be entirely melted and uniformly mixed before sale.

Milk preserved by freezing, G. Fascetti (*Staz. Sper. Agr. Ital.*, *48* (*1915*), *No. 1, pp. 61–65*).—Analytical data are reported giving the composition of the top, middle, and lower portions of frozen blocks of milk. The top portion contained 3.8 per cent of fat, the middle section 1 per cent, and the lower section 1.7 per cent.

Note on the origin of the lactic acid bacteria in milk, P. F. McGuire (*Bul. Johns Hopkins Hosp.*, *26* (*1915*), *No. 297, p. 386*).—The author found in his studies that the lactic acid organism, known usually as *Streptococcus lacticus*, is a normal constituent of cow dung.

Milk receives few bacteria from stable air, F. H. Hall (*New York State Sta. Bul. 409, popular ed.* (*1915*), *pp. 10, fig. 1*).—This is a popular edition of Bulletin 409, previously noted (E. S. R., 34, p. 183).

A bacteriological study of an epidemic of septic sore throat, C. Krumwiede, Jr., and Eugenia Valentine (*Jour. Med. Research*, *33* (*1915*), *No. 2, pp. 231–238*).—An account of an epidemic of septic sore throat in a village of 4,250 inhabitants, found to have its source in the milk supply coming from a certain dairy.

In a bacteriological study it was demonstrated that infection in milk-borne sore throat is of human and not of bovine origin. It is suggested that "in tracing the source of such an epidemic, the effort should be toward finding cases of sore throat among those engaged in producing the milk, not mastitis in the cow alone. If human streptococci are found in mastitis, they are most likely secondary agents in an already existing inflammation due to bovine strains. The streptococci in different epidemics differ culturally and those similar culturally differ in their immunity reactions. Cultural similarity of strains from man and cattle is insufficient to prove their identity. Cultural identity in every detail or immunological identity is essential."

The development of fishy flavors in butter, L. A. Rogers (*Proc. Wis. Buttermakers' Assoc.*, *13* (*1914*), *pp. 70–80*).—The items discussed in this paper are the cause of flavors and aroma in butter, conditions under which fishy flavor develops, factors which do not cause fishy flavor, influence of acid on cream, influence of the air in the butter, influence of metal salts on the flavor of butter, and preventing fishy flavor.

High vs. low testing milk for cheese making, R. C. Jones (*Hoard's Dairyman*, *50* (*1915*), *No. 17, p. 522*).—In a test to show the difference between the cheese-making capacities of high and low testing milks it was found that the high testing milk (4.3 per cent) yielded 1.5 lbs. more of cheese per 100 lbs. of milk, but the low testing milk (3.5 per cent) yielded 0.16 lb. more of cheese per pound of milk fat. This is explained by the fact that the casein increases with the fat but not in proportion, so that the yield per pound of fat decreases

as the fat increases. Cheese from the low testing milk showed an average score of 0.833 points above those from the high testing milk. An analysis of the cheese showed for the low testing milk 32.93 per cent fat and 26.23 per cent water, and for the high testing milk 31.21 per cent fat and 25.96 per cent water. The loss in the whey was found to be 0.2 per cent of fat for the low testing milk and 0.25 per cent for the high testing milk.

Of the high testing milk, the average per cow for 201 cows was 28.2 lbs. of milk, 1.25 lbs. of fat, and 3.3 lbs. of cheese per day, whereas for the low testing milk, the average per cow for 150 cows was 31.9 lbs. of milk, 1.15 lbs. of fat, and 3.3 lbs. of cheese per day, the amount of cheese per cow per day thus being the same in both instances. It is advised not to give up the fat basis of paying for milk at cheese factories until something better can be put in place of it, nor to go back to the old system of paying for weight alone as it is grossly more unjust than the present one.

Paraffining whey cheese (*Abs. in N. Y. Produce Rev. and Amer. Cream., 40 (1915), No. 17, pp. 706, 707*).—In experiments in Norway in paraffining whey cheese it was found that the increase in weight by paraffining was 3.98 gm. per kilogram. The shrinkage in from 2 to 2.5 months was 0.034 per cent for the paraffined and 1.21 per cent for the unparaffined cheese. When paraffined the cheese must be firm and dry on the outside and the storeroom must be dry and free from drafts.

How Parmigiano cheese is made (*Dairy, 27 (1915), No. 322, p. 263*).—A description of the methods of making Lodigiano or Parmigiano cheese of Milan. It is said that much of this cheese is exported to America, but that the finest quality is hardly known outside of Italy. The ordinary grade is sold when ripened for 20 months; the next better grade, known as Stravecchio, is sold after it has been stored for three years; while the best grade, called Stravecchione, or the oldest and highest priced Parmigiano cheese, is sold after four years' storage.

The by-products of the city milk plant and their economic value, J. H. Schlenvogt (*Milk Dealer, 5 (1915), No. 2, pp. 12–16*).—Methods of making various kinds of artificial buttermilk are discussed.

Fermented milks, L. A. Rogers (*U. S. Dept. Agr. Bul. 319 (1916), pp. 30, fig. 1*).—This bulletin presents a brief résumé of present knowledge of the therapeutic and food value of fermented milk and of the preparation and use of the various forms of fermented milk, including buttermilk, kefir, koumiss, and yoghourt. A bibliography of 82 references is included.

Preserving milk powder (*Sci. Amer., 113 (1915), No. 23, p. 489*).—A patented method for preserving milk powder is described. The milk powder is packed in metal boxes of convenient size which are entirely sealed except for a pinhole left at the top. A number of such boxes are put in a chamber and the air is exhausted by means of an air pump. When this operation is finished, valves are opened which allow nitrogen to enter the chamber and fill up the several boxes. Then opening up the chamber, the boxes are quickly removed and the pinhole soldered before an appreciable amount of air has time to enter. In this way the contents of the boxes are kept in an atmosphere of inert gas, thus preventing spoiling by the action of the air.

VETERINARY MEDICINE.

Beri-beri and cotton-seed poisoning in pigs, G. M. Rommel and E. B. Vedder (*U. S. Dept. Agr., Jour. Agr. Research, 5 (1915), No. 11, pp. 489–493*).—It is pointed out that pigs are peculiarly susceptible to the effects of cotton-seed meal, symptoms of sickness appearing at any time after 3 weeks of

feeding and death frequently occurring with little warning. Among the more pronounced symptoms observed are diarrhea; a harsh, rough, curly coat; paralysis; and shortness of breath. Emaciation and dropsical conditions are also frequently noted. The disease manifests two forms—acute and chronic, the former being much more serious since the pigs may be dead before any indications of disease are noticed, whereas in the chronic form fatal results may not occur for a considerable time. "On post-mortem examination, pigs which have died from the effects of cotton-seed meal feeding show large quantities of fluid in the abdominal and thoracic cavities and in the pericardial sac. The kidneys, liver, spleen, and small intestines are usually congested. In some cases the membrane lining the stomach is eroded. The lungs are very edematous, especially in pigs which have died from sudden acute attacks. The heart is enlarged."

It is pointed out that these conditions bear a striking resemblance to those seen in the disease known as beri-beri in man, which according to Vedder (E. S. R., 33, p. 365) results from faulty metabolism and is directly caused by the deficiency of certain vitamins in the food.

Experiments were conducted by the authors with a view to determining (1) whether the "wet" or acute form of beri-beri could be produced in pigs on a diet of polished rice, and (2) whether the disease heretofore called "cotton-seed poisoning" in pigs is not really beri-beri. Commencing on August 31, 1915, four pigs were fed a ration of 9 parts (by weight) of steamed polished rice and 1 part of tankage, and four a ration of 2 parts of corn meal and 1 part of cotton-seed meal. On October 24 the ration of the latter pigs was changed to equal parts by weight of corn meal and cotton-seed meal. None of these pigs had received rice or cotton-seed meal before they entered the experiment.

On September 8, or the eighth day from the beginning of the experiment, one of the pigs on rice began to breathe with difficulty; on the tenth this condition was pronounced and he refused to eat. On September 14 these symptoms rapidly became more severe, paralysis developed, and the pig died. The ante-mortem symptoms and the post-mortem findings were the same as occur in beri-beri and in acute cotton-seed poisoning. On September 21, four additional pigs were placed on the same steamed rice and tankage ration (9:1). On September 29, or 8 days later, one of these pigs became sick and on September 30 refused to eat. This pig recovered and regained his normal appetite, but died on October 29, after having been on the rice diet for 38 days. The ante-mortem symptoms corresponded closely to those of the first pig to die, but the post-mortem examination did not give such clear cut results. The remaining 10 pigs are being continued on the rice and cotton-seed meal rations, having been almost 90 days on these feeds at the time this article was prepared. All the pigs were sick at that time and the same symptoms are said to have appeared in each lot, the most typical and acute cotton-seed meal symptoms being seen among the pigs receiving rice.

A mature brood sow, weighing 400 lbs., due to farrow on November 14, was placed September 2 on a cotton-seed meal ration consisting of 4 parts of corn meal and 1 part of cotton-seed meal, the quantity of corn meal being gradually decreased until, on October 1, she was receiving equal parts of corn meal and cotton-seed meal. Up to November 14 she had eaten 134.65 lbs. of cotton-seed meal, but had shown no serious sign of sickness, except nausea on November 4, when she vomited. On the night of November 13 9 pigs were delivered, 4 of which were born dead and of those born alive all but one died in a few minutes, the last pig living less than 8 hours. Post-mortem examinations were made of 7 of these pigs, 4 of which were born alive. Analogy with infantile

beri-beri is pointed out. Yet the dam had never eaten rice and the only assignable cause for the death of her litter was the cotton-seed meal in her ration.

The conclusions drawn by the authors are that the so-called cotton-seed poisoning of pigs is a deficiency disease, analogous to the disease known as beri-beri in man, if not identical with it. Acute cotton-seed poisoning corresponds to wet beri-beri and the chronic form to dry beri-beri.

"The cause of the so-called cotton-seed poisoning is probably a deficiency in the ration, causing, among other manifestations, profound changes in the nervous system. At first thought this theory is not justified. Beri-beri results from a ration of highly milled rice, because substances vitally necessary to the animal organism have been removed from the rice grain in the process of milling. When pigs suffer from so-called cotton-seed poisoning, it is only when cotton-seed meal has been added to the ration. Pigs are seldom, if ever, fed on cotton-seed meal alone.

"The following explanation of this condition is offered: The grain with which the cotton-seed meal is most frequently combined is corn. Corn is notoriously deficient as a single feed for animals, and it must be properly balanced to be fed satisfactorily. The excellent results in feeding pigs which can be obtained from rations of corn meal and skim milk or other animal products, such as tankage, blood meal, fish meal, etc., are out of all proportion to the facts indicated by the conventional chemical analyses of protein, carbohydrates, and fat. When corn meal is fed with cotton-seed meal, a combination is made of two feeds both of which are deficient."

The toxicity of sodium pyrophosphate administered in food; with a note on toxic cotton-seed meal, W. L. Symes and J. A. Gardner (*Biochem. Jour., 9 (1915), No. 1, pp. 9–16*).—"Sodium pyrophosphate administered, with food, to rabbits, cats, and rats, is devoid of the toxic action that it shows when intravenously injected. This confirms the verdict of Gamgee and his pupils, and of Starkenstein. Administered to a sheep in the same way, it has proved lethal, producing effects similar to those described by Crawford [E. S. R., 23, p. 8] as following its administration in aqueous solution to rabbits. Such toxic action as sodium pyrophosphate exerts when administered by the mouth differs from that of the same compound intravenously injected, in that it is wholly due to the alkalinity of the salt and not to the acid radicle."

The influence of the oil of Chenopodium on the circulation and respiration, W. Salant and A. E. Livingston (*Amer. Jour. Physiol., 38 (1915), No. 1, pp. 67–92, figs. 14*).—The investigations here reported in detail have been summarized by the authors as follows:

"The intravenous injection of doses of 0.02 to 0.085 cc. of Chenopodium per kilo produced a fall of blood pressure in dogs, cats, and rabbits. Recovery was observed. The effect was greater in dogs than in rabbits or cats. A second injection of the same dose produced a greater effect, but when this injection was repeated until the total amount reached about 0.2 cc. per kilo, no response of the circulation could be observed. This was especially the case in dogs, but to a much smaller extent in cats, [and] absent in rabbits. Fall of blood pressure was of cardiac origin, as the volume of the kidneys decreased with the fall of blood pressure. Frequency of heart action was diminished after oil of Chenopodium, [and] very marked decrease of vagus irritability was observed. . . . Respiratory depression such as decreased amplitude and rate, with apnœa, was also caused by Chenopodium, but the effect with small doses was less constant than on the circulation. Cats react more readily than dogs. Small doses may stimulate respiration in rabbits. Apnœa was very seldom observed in the rabbit, even after large doses.

"No methemoglobin or hemolysis was observed even after the intravenous injection of 0.02 to 0.024 cc. per kilo, or the introduction of 2 gm. per kilo into the stomach or small intestine of the cat. Liberation of oxygen in the body by ascaridole is suggested as a possible cause of respiratory depression and apnœa. Action of Chenopodium on respiration is independent of its effect on the circulation, [and] reduction of sensitiveness of respiratory center to carbon dioxid is not the cause. . . . Amounts of Chenopodium tolerated by intravenous injection varied in the same animals. The average is approximately 0.03 to 0.35 cc. per kilo in the dog, cat, and rabbit. The less depressant action of Chenopodium on respiration in the rabbit is attributed to relatively larger amounts of carbon dioxid in the blood."

Animal castration, J. V. LACROIX (*Chicago: Amer. Jour. Vet. Med., 1915, pp. 144, figs. 23*).—This volume is based upon observations extending over a period of ten years.

A text-book of veterinary pathology for students and practitioners, A. T. KINSLEY (*Chicago: Alexander Eger, 1915, 2. ed., rev. and enl., pp. VIII+19–404, figs. 197*).—A revised and enlarged edition of the work previously noted (E. S. R., 24, p. 777).

A treatise on horses and cattle, A. H. PRUITT (*Hays, Kans.: Author, 1915, pp. 78, pl. 1*).—A popular account is given of the more common diseases of horses and cattle and their treatment.

[Report of the] division of animal industry, V. A. NÖRGAARD and L. N. CASE (*[Bien.] Rpt. Bd. Comrs. Agr. and Forestry Hawaii, 1913–14, pp. 163–244, pls. 7*).—In a letter submitting this report (pp. 163–176) V. A. Nörgaard points out the results which have been obtained from the past ten years' work of the division in the eradication of glanders, complete control of sheep scab, eradication of 90 per cent of bovine tuberculosis, exclusion of rabies, etc. Under the heading of diseases of live stock the work of the year with the more important diseases is dealt with. The intradermal test and its importance in the control and eradication of tuberculosis is considered at some length (pp. 192–196), the authors concluding that it is reliable in 99 per cent of cases, and that bovine tuberculosis will be controlled and eradicated more effectively and economically by its use than by any other method of examination. The importance of the control of bovine tuberculosis is emphasized.

Reports of the deputy territorial veterinarians for the Hilo district by H. B. Elliot (pp. 208–229), for the Maui district by J. C. Fitzgerald (pp. 230–240), and for the Kauai district by A. R. Glaisyer (pp. 241–244) are appended.

Nomenclature of the Coccaceæ, R. E. BUCHANAN (*Jour. Infect. Diseases, 17 (1915), No. 3, pp. 528–541*).—The Winslows' classification of the Coccaceæ (E. S. R., 20, p. 1079), as corrected by the author as a result of his study of the validity of the subfamily and generic names, becomes the following:

A. Tribe Streptococceæ Trevisan—Genus 1, Neisseria Trevisan; genus 2, Leuconostoc Van Tieghem; genus 3, Streptococcus Rosenbach; genus 4, Staphylococcus Rosenbach; genus 5, Albococcus Winslow and Rogers. B. Tribe Micrococceæ Trevisan—Genus 6, Micrococcus Cohn; genus 7, Sarcina Goodsir; genus 8, Rhodococcus Zopf.

A bibliography of 26 titles is appended.

The results of blood cultures from thirty-six individuals, with their possible bearing on the etiology of the so-called filarial diseases; and description of a new parasitic bacillus, believed to be the causative agent of filariasis, B. H. DUTCHER and P. L. WHITMARSH (*Amer. Jour. Trop. Diseases and Prev. Med., 3 (1915), No. 2, pp. 69–74*).—The investigation here reported has led the authors to believe that they are justified in claiming that the

organism isolated, for which the name *Bacillus lymphangiticus* is proposed, is the cause of the diseases grouped under the designation of "filariasis."

Review of recent studies in trichiniasis, W. W. HERRICK (*Jour. Amer. Med. Assoc., 65 (1915), No. 22, pp. 1870–1872*).—This review of the recent literature includes a list of 21 references.

The anatomical and histological expression of increased resistance toward tuberculosis in cattle following the intravenous injection of human and attenuated bovine tubercle bacilli, T. SMITH (*Jour. Med. Research, 32 (1915), No. 3, pp. 455–469, pls. 4*).—"The intravenous injection of tubercle bacilli of bovine type into calves, following preliminary injections of bacilli of human or attenuated bovine type causes a heightened resistance which manifests itself by a shifting of the lesions from the parenchyma of the lungs, i. e., the alveolar walls, to the bronchioles serving lobules or portions thereof. The affected lobules are subpleural.

"The disease is chronic and progressive to a certain degree at least. It develops as a peribronchial inflammation in which lymphoid or round cells predominate. This may break through the wall of the bronchus, fill the lumen, cause collapse, aspiration of ingrowing cell masses with tubercle bacilli, and subsequent caseation of the collapsed territory. Veins and arteries in the immediate neighborhood of affected bronchioles are not invaded.

"The beginning of tuberculous changes in the wall of the minute bronchi is not in itself proof that the bacilli are air-borne, nor does it prove that inhaled bacilli have penetrated directly the mucosa of the minute bronchi. Localization depends very materially upon states of resistance of the host, or, what is equivalent, on the degree of virulence of the tubercle bacilli. The type of cell reaction is the same in the udder as in the lungs. Endothelioid and giant cells seem to be much more numerous in those cases whose acquired resistance is lowest.

"The development of tuberculosis in the apical lobes in man is best accounted for by the less active aeration and less active lymph current. Rib pressure may contribute toward fixing the bacilli. Bacilli, deposited either from the air or the blood in other lobes, are either destroyed or promptly carried by the lymph current to the lymph nodes, where they are gradually destroyed. The phenomenon of phthisis in man is strong evidence that the human being possesses a relatively high degree of resistance to the tubercle bacillus. This inference from comparative pathology has been abundantly proved in the past by autopsy records."

Special cattle therapy, M. R. STEFFEN (*Chicago; Amer. Jour. Vet. Med., 1915, pp. 157*).—A concise practical treatise on the treatment of the commoner diseases of cattle.

Skin disease of cattle in Antigua, P. T. SAUNDERS (*West Indian Bul., 15 (1915), No. 1, pp. 36–46*).—A compilation of the author's observations.

Gongylonema scutatum, E. D. CORTELEZZI (*Rev. Facult. Agron. y Vet. La Plata, 2. ser., 11 (1915), No. 3, pp. 152–156, fig. 1*).—The author reports having observed this parasite in the esophageal mucosa of a bovine slaughtered at La Plata in April, 1915. This is said to be the first record of its occurrence in Argentina.

Piroplasmosis among European cattle with special reference to the etiology, P. KNUTH (*Arch. Schiffs u. Tropen Hyg., 19 (1915), No. 9, pp. 245–267; abs. in Amer. Jour. Trop. Diseases and Prev. Med., 3 (1915), No. 2, pp. 113, 114*).—A somewhat extended review of the subject.

An outbreak of septicemia hemorrhagica among cattle in New York State, C. P. FITCH (*Cornell Vet., 5 (1915), No. 1, pp. 17–24*).—The author reports in detail studies made during the course of an outbreak of hemorrhagic septi-

cemia in New York State. These have led to the conclusions that "the symptoms of septicemia hemorrhagica could easily be confused with those of certain nonspecific infections; that a careful bacteriological examination, including animal inoculation of fresh specimens, should be made of all cases in which septicemia hemorrhagica is suspected; and that a further and extensive research must be done in order to determine the exact relationship of the bacteria which comprise the so-called septicemia group or pasteurella."

Directions for constructing vats and dipping cattle to destroy ticks, H. W. GRAYBILL and W. P. ELLENBERGER (*U. S. Dept. Agr., Bur. Anim. Indus. Circ. 207, rev. ed. (1915), pp. 22, figs. 3*).—A revised edition of the circular previously noted (E. S. R., 28, p. 181). A plan for a concrete vat for range conditions has been added.

The etiology of "symptomatic anthrax" in swine.—"Specific gas-phlegmon of hogs," K. F. MEYER (*Jour. Infect. Diseases, 17 (1915), No. 3, pp. 458–496, figs. 5*).—The author proposes the name of specific gas-phlegmon of hogs for the disease here considered. "The methods and media recommended by von Hibler [E. S. R., 20, p. 1080], the agglutination tests, and the serum immunization of guinea pigs proved to be very reliable for the separation and identification of closely allied anærobes. . . .

"The study of this disease, additional experiments, and a critical survey of the literature fail to prove that hogs are spontaneously attacked by symptomatic anthrax, or that they are susceptible to *Bacillus chauvœui*."

A bacteriologic study of secondary invaders in hog cholera, F. EBERSON (*Jour. Infect. Diseases, 17 (1915), No. 2, pp. 331–338*).—"Organisms belonging to the *Bacillus paratyphosus* group were chiefly associated with the lungs and spleen of hogs infected with the virus of hog cholera. *B. coli* was frequently found in the lungs and spleen, either alone or in combination with organisms of the paratyphoid group. *B. suisepticus* was isolated in few cases, but 9 out of 55, and was found chiefly in the intestine.

"Classification of the organisms shows that the greatest number belonged to the *B. paratyphosus* B group. The majority of these did not form indol and were found chiefly in the lungs and spleen. Bacterial findings did not appear to be correlated with the lesions observed in different organs. The significance of secondary invaders in hog cholera is not apparent from a study of the lesions and the different groups of organisms isolated."

Separation of the antibody fractions in hog cholera serum, F. EBERSON (*Jour. Infect. Diseases, 17 (1915), No. 2, pp. 339–350, figs. 2*).—"Hog-cholera serum can be split up by chemical means into an actively protecting globulin fraction and an inactive albumin fraction. Precipitation of serum proteins by means of ammonium sulphate is practically possible for hog-cholera serum. The bulk of the serum, being inactive albumin, may be dispensed with.

"Concentration for practical purposes may be effected (1) by precipitating the euglobulins from diluted serum, by means of 33⅓ per cent saturation with ammonium sulphate solution, filtering, making the filtrate up to 50 per cent concentration with ammonium sulphate solution, filtering, and, after dialyzing the precipitate in running water, dissolving it in the smallest volume of salt solution; (2) by precipitating the diluted serum (diluted 10–15 times) by one-half saturation with ammonium sulphate (saturated solution), filtering, dialyzing the precipitate, and treating as in (1). Since both globulin constituents are protective, this method would prove more economical and simpler.

"Euglobulin represents from 20 to 21 per cent of the total serum protein, pseudoglobulin 0.5 per cent, and albumin about 80 per cent."

An echinostome from the intestine of the hog, JOAN CIUREA (*Centbl. Bakt. [etc.], 1. Abt., Orig., 75 (1915), No. 5–6, pp. 392–394, fig. 1*).—The author describes *Echinochasmus perfoliatus*, four adults of which were found in the intestines of a young pig which had been fed for two months upon fish (*Carassius carassius*). This species had been previously found in Hungary in the intestines of dogs and cats.

A veterinary dissection guide.—I, The joints, muscles, and viscera of the horse, S. SISSON (*Columbus, Ohio: Author, 1915, 2. rev. ed., pp. VI+55*).—The changes in this second edition of the work previously noted (E. S. R., 26, p. 373) are chiefly those made necessary to adapt it for use in connection with the author's work on The Anatomy of the Domestic Animals (E. S. R., 32, p. 78).

Epizootic laryngo-tracheal catarrh of the horse, G. FINZI (*Ann. Ig. Sper., n. ser., 24 (1914), No. 4, pp. 655–671, fig. 1*).—The author concludes that this affection is due to a noncultivable filterable virus.

[Studies of the causative organism of epizootic lymphangitis], L. NÈGRE and A. BOQUET (*Bul. Soc. Path. Exot., 7 (1914), No. 6, pp. 464–466, figs. 10; 8 (1915), Nos. 2, pp. 49–52, figs. 6; 5, pp. 248–250; abs. in Trop. Vet. Bul., 2 (1914), No. 3, p. 152; 3 (1915), Nos. 2, pp. 71, 72; 3, pp. 111, 112*).—The authors' studies deal, respectively, with the blastomycotic nature of *Cryptococcus farciminosus*, its cultivation, and development in the horse.

Trypanosoma marocanum n. sp., the cause of an epizootic among horses at Casablanca in 1911, E. SERGENT, A. LHÉRITIER, and G. BELLEVAL (*Bul. Soc. Path. Exot., 8 (1915), No. 7, pp. 433–438*).—The trypanosome here described (*T. marocanum*) has been shown by cross immunity experiments to be distinct from *T. berberum*, *T. equiperdum*, and *T. soudanense*. Horses attacked by it generally succumb in some weeks, goats were found to be susceptible but recovered, and dogs died in about two months.

The comparative pathology of the tracheal and bronchial lesions produced in man by B. pertussis (whooping cough) and those produced in dogs by B. bronchisepticus (canine distemper), L. J. RHEA (*Jour. Med. Research, 32 (1915), No. 3, pp. 471–474*).—The author considers it most probable that dogs will be found to be carriers of *Bacillus bronchisepticus*, as has been demonstrated for guinea pigs. "When the respiratory system of animals liable to harbor *B. bronchisepticus* is experimentally inoculated with *B. pertussis*, the accompanying irritation might be followed by acute symptoms resulting from *B. bronchisepticus* already present and not from *B. pertussis* injected."

Frequency of occurrence of tumors in the domestic fowl, MAYNIE R. CURTIS (*U. S. Dept. Agr., Jour. Agr. Research, 5 (1915), No. 9, pp. 397–404*).—This record of the frequency of occurrence of tumors in the domestic fowl (*Gallus domesticus*) is based upon data collected during 8 years' routine autopsy work at the Maine Experiment Station.

The chief points brought out by an analysis of these data are summarized by the author as follows: "Of the 880 birds autopsied 79, or 8.96 per cent, had tumors. That is, there were 90 cases of tumors per 1,000 birds. There was no significant difference in frequency of occurrence of tumors between birds which died from natural causes and apparently normal birds which were killed. There is a significant positive correlation between age and the occurrence of tumors. Only 7.37 per cent of the birds under 2.25 years had tumors, while neoplasms were present in 19.17 per cent of those that were over that age. In birds with tumors which died from natural causes, the tumors were directly or indirectly the probable cause of death in from one-third to one-half the cases.

"There was a decided tendency for the association of hypertrophied (apparently due to cell infiltration) liver, spleen, or kidney with the presence of tumors

in other organs. Death often resulted from internal hemorrhage from the tumor, the underlying tissue, or the hypertrophied liver or spleen. The tumors can be classified into cystic and tissue tumors; 22.78 per cent of the tumors were of cystic and 74.68 per cent of solid tissue structure. There were two cases of tissue tumors to which cysts were attached.

"In the females the organs most frequently affected were the genital organs; 37.76 per cent of all the tumors being in the ovary and 18.36 per cent in the oviduct and oviduct ligament. In most cases the tumors were confined to one organ. In 15 cases, however, the tumor had evidently undergone metastasis, since tumors of similar nature occurred in from two to four organs."

An outbreak of roup and chicken pox in which the high mortality was apparently caused by a secondary invader, B. A. Beach, H. Lothe, and J. G. Halpin (*Jour. Infect. Diseases, 17 (1915), No. 3, pp. 554–558*).—During the course of investigations of an outbreak of roup and chicken pox in a large flock of poultry the authors isolated a bacillus which resembles that of chicken cholera but differs from it in several respects.

"The data which we could gather as regards the biology of this organism indicate that it probably belongs to the hemorrhagic septicemia group. As pointed out, under the microscope it resembles fowl cholera but differs from it markedly in two respects: (1) Cultural characteristics. Growth was very meager, while fowl cholera exhibits much heavier growth, will live much longer outside the animal body, and has a different appearance culturally when grown on agar slopes. (2) Pathogenicity. . . . Ducks are immune to this organism, and the injection of killed cultures confers no immunity to fowl cholera. This is a disease of wound infection, while fowl cholera may be transmitted by way of the mouth.

"Just what relation secondary invaders have to roup and chicken pox in general throughout the country is hard to state, as unfortunately we have not had opportunity to investigate another outbreak where the mortality ran high. However, it seems reasonable to suppose that their rôle is far from inconsequential when we consider the wide range in mortality in different outbreaks in which the lesions both as to character and extent are similar."

Diseases of poultry: Their etiology, diagnosis, treatment, and prevention, R. Pearl, F. M. Surface, and Maynie R. Curtis (*New York: The Macmillan Co., 1915, pp. XI+342, figs. 72*).—A revised and enlarged edition of the work previously noted (E. S. R., 25, p. 387).

RURAL ENGINEERING.

Irrigation practice and engineering.—I, Use of irrigation water and irrigation practice, B. A. Etcheverry (*New York: McGraw-Hill Book Co., 1915, vol. 1, pp. XIII+213, pls. 13, figs. 77*).—This volume, the first of a series on the subject, deals with the use of irrigation water and with irrigation practice, and is intended as a text-book for students and teachers and as a reference book for irrigation engineers and managers and superintendents of irrigation systems.

The following chapters are included: Soil moisture and plant growth and their bearing on irrigation practice; disposal of irrigation water applied to the soil, plant transpiration, soil moisture evaporation, soil water percolation, surface waste; water requirement of irrigated crops; results of investigations and irrigation practice regarding proper time to irrigate, frequency of irrigations for different crops, irrigation season; duty of water; preparation of land for irrigation and method of applying water to the land; farm ditches and structures

for the distribution of irrigation water; and the selection and cost of a small pumping plant.

It is stated that a large part of the subject matter has been drawn from publications of the U. S. Department of Agriculture and of the U. S. Reclamation Service.

Irrigation practice and engineering.—II, Conveyance of water, B. A. Etcheverry (*New York: McGraw-Hill Book Co., 1915, vol. 2, pp. XVIII+364, pls. 31, figs. 82*).—This book, the second of the series on the subject (see above), contains the following chapters:

General features and preliminary investigations to determine the general feasibility of an irrigation project; procedure in the planning and location of an irrigation system; hydraulic formulas specially applicable to computations of irrigation canals and structures; silt problems in the design of irrigation systems; conveyance losses in canals; the design of canal cross sections; canal linings and the prevention of seepage losses; tunnels, concrete retaining wall canal sections, and bench flumes; flumes; and pipes and inverted siphons.

Irrigation and settlement in America, A. D. Lewis (*Pretoria: Govt., 1915, pp. 258, pls. 38, figs. 54; rev. in Engin. Rec., 72 (1915), No. 3, pp. 84, 85*).—This book describes a number of western irrigation projects, taking up for each project the following points: Physical conditions, outline of the scheme, engineering works of interest, soil and agricultural conditions, settlement and cost, and distribution and duty of water. The chapters deal with the Belle Fourche, Huntley, Shoshone, Boise, Snake River, Minidoka, Twin Falls north and south, Oakley, Salmon River, Great Basin, Salt Lake, Truckee-Carson, Modesto-Turlock, Fresno, Redlands, Imperial Valley, Yuma, Salt River, and Rio Grande schemes.

Subtopics and appendixes deal with sugar-beet cultivation, crop experiments at Logan, Utah, Californian irrigation, how the federal and state governments help settlement, and the Reclamation and Carey acts.

Maintenance of irrigation systems, F. H. Newell (*West. Engin., 6 (1915), No. 4, pp. 147–151*).—This article discusses the proper segregation of expenditures for construction, maintenance, betterments, repairs, and operation.

Selection of pumps for irrigation, C. Remschel (*Jour. Electricity, 35 (1915), Nos. 11, pp. 196, 197; 12, pp. 214–217, figs. 6*).—Suggestions on the principles of pump selection for irrigation pumping are given, with special reference to centrifugal, deep-well, power-plunger, and air-lift pumps.

Centrifugal pumps, R. L. Daugherty (*New York: McGraw-Hill Book Co., 1915, pp. X+192, figs. 111; rev. in Power, 42 (1915), No. 8, p. 284; in Engin. News, 74 (1915), No. 25, pp. 1172, 1173*).—It is the purpose of this book "to illustrate and explain all the essential features of construction of modern centrifugal pumps, to present a clear and intelligible theory which shall be entirely general in its nature, to explain by this theory the pump characteristics and connect the theory with the actual facts, to present a thorough discussion of the factors affecting efficiency, to consider the characteristics of various types of pumps and their suitability for different services, to compare centrifugal with displacement pumps, and to present various general laws and factors leading to a better appreciation of the field of service of such pumps and a better means of selecting the proper combination. . . . The material is based upon a study of the performances of 123 turbine and 51 volute centrifugal pumps. . . . The field covered by them ranged from 1 to 11 stages, heads from 7 to 1,843 ft., capacities from 108 to 132,000 gal. per minute, speeds from 62 to 20,000 r. p. m., and efficiencies from 30 to 87 per cent. A considerable portion of the work is also founded upon the analysis of tests made by the author upon a volute pump and a turbine pump for both of which all

information regarding dimensions and other quantities was obtainable. With the turbine pump an extensive series of tests was made at various speeds from 700 to 2,000 r. p. m."

Method of computing run-off in draining irrigated lands, H. C. MILLER (*Engin. and Contract., 44 (1915), No. 8, pp. 150, 151*).—The author's method consists in calculating the average maximum rise of the water table in the lowlands where drainage is required on the basis of data secured by a series of borings at regular intervals, made usually in the spring. This average rise multiplied by the average porosity coefficient of the soil gives the depth on the surface to be removed by drainage.

Construction of drainage system for Pioneer Irrigation District, Idaho, F. T. CROWE (*West. Engin., 6 (1915), No. 4, pp. 160–162, figs. 3*).—Heavy irrigation, both on the higher lands and in the area comprising 34,000 acres of irrigable land, caused the ground water in this region to rise, flooding the lower lands, and the alkali to rise in the remaining area. The soil is a heavy loam underlaid with from 7 to 12 ft. of either clay or hardpan. As a remedy a system of about 50 miles of drainage ditches, varying in depth from 7 to 14 ft. and in bottom width from 5 to 10 ft., was constructed with dragline excavators at an average cost for the entire project of 8 cts. per cubic yard. Measurements of flow in the various drains indicate that the flow is decreasing with the gradual lowering of the ground-water level.

Conduits for water, G. J. HENRY (*Jour. Electricity, 35 (1915), No. 7, pp. 107–113, figs. 4*).—Theoretical considerations and tables of data for the design of metal pipe lines are given.

Surface water supply of the North Atlantic coast basins for 1913 (*U. S. Geol. Survey, Water-Supply Paper 351 (1915), pp. 189, pls. 2*).—This report, prepared in cooperation with the States of Maine, Vermont, Massachusetts, and New York, contains the results of measurements of flow made on streams in the North Atlantic coast basins in 1913.

The artesian water supply of Australia (*Engineer [London], No. 3029 (1914), p. 63; abs. in Wasser u. Abwasser, 8 (1914), No. 8, pp. 471, 472*).—This report of the Interstate Conference on Artesian Water deals mainly with the Great Australian Basin, an area of 570,000 square miles.

The artesian water supply is said to be principally used for watering stock. With regard to the Great Basin it was decided "that the water was almost wholly, if not entirely, derived from rainfall which percolated through the porous beds under the influence of hydraulic conditions." It is believed "that if agriculture on a large scale were permitted with bore water in what are now pastoral districts the demand would become so great that in a short period the flow would be depleted to such an extent that sufficient water would not be available for pastoral purposes."

Other points, including corrosion of well casings and decrease of flow of wells, are dealt with but with no finality.

Characters of mechanically-filtered water, S. DELÉPINE (*Surveyor, 45 (1914), No. 1171, pp. 1060–1064*).—Tests of two pressure mechanical filters show that treatment by coagulants and mechanical filtration of soft moorland water is satisfactory when reliable plants are used.

Influence of the algæ of submerged sand filters on the chemical composition of water, L. GIZOLME (*Compt. Rend. Acad. Sci. [Paris], 161 (1915), No. 11, pp. 313–316, fig. 1*).—It was found that the reduction of the alkalinity of water caused by filtration is a function of the development and activity of the chlorophyll algæ in the filter, and also of the time of day, the age of the filter, the season of the year, the atmospheric conditions, and the speed of filtration.

Twenty-first annual report of the commissioner of public roads for the year ended October 31, 1914, E. A. STEVENS (*Ann. Rpt. Comr. Pub. Roads [N. J.], 21 (1914), pp. 107, pls. 6*).—This report describes and states the cost of roads improved in New Jersey in 1914 and includes the state highway engineer's report and a report of laboratory and experimental work.

Papers presented at the Pan American Road Congress (*Good Roads, 48 (1915), No. 19, pp. 249–259*).—The following special papers are given: Dust Suppression and Street Cleaning, by W. H. Connell; Equipment for Highway Work, by A. H. Blanchard; Highway Bridges and Structures, by W. S. Gearhart; and Uniformity for Highway Statistics and Data, by H. E. Breed.

Operation analysis of new machines which cheapen the moving of earth on road work, A. B. MCDANIEL (*Engin. Rec., 72 (1915), No. 5, pp. 126–128, figs. 4*).—The conditions affecting the cost of operation of new types of graders and scrapers and the light steam shovel are analyzed, and the usefulness of the full-circle steam shovel in tearing up old paving and making shallow cuts in hard material and the economy of hauling graders and scrapers by tractors are brought out.

Relative twenty-year economy of various types of roads and pavements (*Engin. and Contract., 44 (1915), No. 5, pp. 89–91, figs. 2*).—According to this comparison, the cheapest road from the standpoint of 20-year cost for both urban and rural service is the vitrified brick road built of brick on edge. In order to realize the full economy of the brick road the brick must be laid on edge. With reference to the relative 20-year economy of rural roads, it is brought out that the small community which has to pay a high rate of interest for its money is in a much better position to afford a high-grade macadam road than a more important community more fortunately situated as far as obtaining money at a low rate of interest is concerned.

Maintaining concrete and brick roads in Illinois, B. H. PIEPMEIER (*Engin. News, 74 (1915), No. 7, pp. 310–313, figs. 3*).—A description of the methods of maintaining concrete and brick pavements on state-aided highways in Illinois is given, together with cost data on practically all the more important state roads. A special motor truck, made by rebuilding a small runabout, and a portable heating kettle outfit are used in this work. The data show that the average cost of maintenance when the truck was used was about one-third less than where the portable hand kettle was used. The cost of filling cracks and joints ranged from 0.1 to 0.57 cts. per square yard of pavement, varying usually in proportion to the discontinuity of the pavement. "From a maintenance standpoint it would be an advantage to have as few joints as possible. Four years' experience in maintaining concrete pavements in Illinois indicates that joints, even though protected with armor plates, require about the same attention as do the ordinary cracks."

Rebuilding rural roads in the Southern States, G. B. BUCHANAN (*Engin. News, 74 (1915), No. 10, pp. 446–448, figs. 4*).—The peculiarities of southern rural road improvement are explained in the light of antebellum conditions, and methods and costs of reconstructing corduroy roads are given.

An investigation to determine the relative resistance to wear of concrete made of different aggregates (*Engin. and Contract., 44 (1915), No. 8, pp. 144–147, figs. 21*).—Tests to determine the influence on resistance to wear by concrete roads of the character and quality of stone used for the coarse aggregate are reported. These tests consisted of abrasive and gouging tests of 36-in. rings of 1 : 2 : 4 concrete 8 in. thick. The gouging test was designed to represent the action of horseshoe calks.

In the abrasive tests "it was found in the case of the gravel specimens that when subjected to the action of the shot the gravel would kick out and produce

pockets, and that once formed these pockets would quickly develop into holes. It was also noted that for the hard and tough stones, when used in comparatively large sizes, the bonding mortar would wear away and allow the rock to protrude, making an uneven and bumpy surface. . . . Where the stone presented lines of cleavage, as is present in many hard stones, the protruding stones would laminate and then kick out. Deep pockets were formed when the laminations ran vertically, the part of the stone between the laminations being dislodged and the remainder of the broken stone, having no backing of material, being dislodged. The softer mortar would then break down, followed by the stones surrounding the pocket, and the small pocket would very speedily develop into a much larger pocket. When the laminations ran horizontally the pockets formed were more or less shallow and the unevenness of the surface was not so pronounced. In the crushed stone specimens this condition of surface was developed at a much later period in the course of rattling than in the case of the gravel rings.

"In general, the tests show that crushed stone makes a better wearing surface than the gravels, this advantage being due to the better bond. It was demonstrated in the case of the sandstone specimens that the stone wore down with approximately the same rapidity as the bonding mortar, producing a smooth, even surface. It is also to be noted that the percentage of wear was normal."

In the gouging tests "the kicking out of the gravel was more marked. . . . Also the laminated stones were dislodged much more rapidly."

An investigation of the concrete road-making properties of Minnesota stone and gravel, C. F. Shoop (*Univ. Minn. Studies Engin., No. 2 (1915), pp. V+46, pls. 9, figs. 6*).—This is a detailed report of the above experiments.

Can we use more fine aggregate? W. K. Hatt (*Cement Era, 13 (1915), No. 8, pp. 50, 51*).—The detailed results of tests previously noted (E. S. R., 34, p. 87) are reported in this article.

Suggestions regarding concrete for use on the farm, etc., E. D. Walker (*Ann. Rpt. Penn. State Col. 1912, pp. 89–98, pls. 6, figs. 2*).—General information is given regarding the proportioning and mixing of concrete, building of forms, and placing of the concrete for various farm structures.

Compass surveying and the simplified calculation of farm areas, C. M. Thomas (*Wytheville, Va.: D. A. St. Clair Press, 1915, pp. VI+92, pls. 4, figs. 8*).—This book describes the process of compass surveying and the method of computing land areas by latitudes and departures, with illustrative examples.

Poisoning green timber with sodium arsenite, C. W. Burrows (*Agr. Gaz. N. S. Wales, 26 (1915), No. 9, pp. 767–769*).—In this note the author calls attention to the fact that arsenite of soda has been introduced with marked success in hastening the killing of ringbarked trees. Trees that ordinarily would take months to kill by the old method are now killed in a few weeks and frequently in a few days by the application of arsenic. In order to prevent suckering the operation should be carried on when the tree is dormant. Saplings may be cut off low down and the solution may be dabbed on to kill and prevent suckering.

Cost of fencing farms in the North Central States, H. N. Humphrey (*U. S. Dept. Agr. Bul. 321 (1916), pp. 32, pls. 5, figs. 10*).—This bulletin contains data obtained by circular letter from 5,837 farmers in Ohio, Michigan, Wisconsin, Illinois, Indiana, Minnesota, Iowa, Missouri, Kansas, Nebraska, North Dakota, and South Dakota presenting the essential features of farm fence practice in those States. The purpose of the study was to establish economic standards for fencing and fence management.

It was found that "the large farm requires proportionately less fence than the small one, and the ratio of fence required to the acre decreases in proportion to the increase in size of farm up to a certain limit. Stone, hedge, and the different types of wooden fences were desirable at the time they were first built, but changing economic conditions make them impracticable at the present time, and they are being replaced with wire fencing.

"The best kind of wire fencing to erect depends on the purpose for which the fence is used. On a farm where mixed types of live stock are kept, a general-purpose woven-wire fabric is needed. If only cattle and horses are to be pastured, a coarser and less expensive woven fence can be used. When fencing is needed to inclose extensive pastures where only cattle or horses are to be kept, the excessive cost of a woven-wire fence would not make its use desirable, for losses to stock by injury on barbed wire would not be large enough to counterbalance the difference in the cost of maintaining the two different kinds of fences. This applies to the extensive farming areas of the West.

"It is economy to use a heavy grade of woven-wire fabric. The cost of woven wire is based upon its weight, and a reduction in cost may be obtained by using a style of fencing that has the wires spaced only as close together as is needed to meet the requirements. It is false economy to reduce the first cost of the fence by using a light grade of wire.

"To get the maximum of service out of a fence it is absolutely necessary that it should be well built. The corner posts must be placed solidly in the ground in such a manner that they can not be heaved by frost or drawn loose by the pull of the fence. The fabric should be strung tightly to the end posts, but it ought not to be tightly stapled to the line posts. It should be fastened to line posts in such manner that the wires may move in a horizontal direction to take care of the contraction and expansion due to changes in temperature, and to distribute the force of a blow along the fence line so that the strain will not come entirely on any one or two posts or any one point of the wire. A barbed wire should be placed a short distance above the top of the woven wire to prevent cattle and horses from crowding it down when reaching over or rubbing against the fence."

The cost of a good general-purpose farm fence constructed from durable materials is estimated as follows:

	Per rod.
First cost:	
Line posts; red cedar, hedge, locust, cement, or steel (1 rod apart)	$0.280
Ends and braces; cedar, hedge, locust, cement, or steel (every 40 rods)	.125
Woven wire; 10 strands, 47 in. high, stays 12 in. apart, all No. 9	.400
Barbed wire; 1 strand placed 4 in. above top of the woven wire	.035
Staples	.005
Labor cost of construction	.090
Total	.935
Annual cost of upkeep:	
Repairs, including the cost of keeping the fence row clean	.024
Interest at 5 per cent on average investment ($0.4675)	.023
Depreciation, estimating that the life of the fence is 22 years	.043
Total	.090
Interest on the land occupied at the rate of 5 per cent per year:	
108.6 sq. ft. per rod, valued at $125 per acre	.155
Total annual cost	.245

Practical suggestions given for building wire fences and concrete posts, R. N. Wheeler (*Engin. Rec., 72 (1915), No. 12, pp. 361, 362*).—This article explains in detail methods of building wire fences and concrete posts and gives practical suggestions based on fence-building experience.

A course of study in farm engines, R. Olney and P. A. Tanner (*Farm Engin., 1 (1913), No. 2, p. 14; 1 (1914), Nos. 3, pp. 16, 22, figs. 4; 4, p. 7, figs. 4; 5, pp. 12, 13, figs. 2; 6, pp. 12, 13, figs. 2; 7, p. 10, figs. 2; 8, p. 7, fig. 1; 2 (1914), Nos. 1, p. 7; 2, p. 25; 3, p. 52; 4, p. 69; 5, p. 89; 6, p. 120, figs. 2; 2 (1915), Nos. 7, pp. 144, 146, figs. 5; 8, pp. 166, 167, figs. 3; 9, pp. 190, 191, figs. 3; 10, pp. 226, 227, 239, figs. 6; 11, pp. 250, 251, figs. 5; 12 p. 272, figs. 4; 3 (1915), Nos. 1, pp. 4, 5, figs. 4; 2, pp. 29, 33; 3, pp. 49, 50*).—This is an exposition of the principles involved in the construction and operation of farm gas engines.

Burning bagasse, E. W. Kerr (*La. Planter, 54 (1915), No. 20, pp. 315–318, figs. 4*).—The author reports data from various experiments with bagasse as a fuel for sugar refineries.

It is shown that the loss of heat in the chimney gases is the greatest heat loss and this loss is much greater for bagasse than for other fuels. Other data show that "very high rates of combustion are [not] necessary." It is stated that the less moisture there is in the bagasse the smaller the grate can be without danger of choking the furnace. "This means that in Louisiana relatively large grates and correspondingly low rates of combustion are best." With reference to the loss due to incomplete combustion of carbon "it may be said that this loss is usually small as compared with the loss due to excess air, etc."

The results of a series of tests on three typical bagasse boilers are also reported, the object of which was, among other things, to determine the relative merits of varying sizes and forms of bagasse furnaces. The outfits tested were a 150-horsepower H. R. T. boiler with a standard Dutch oven, a 250-horsepower H. R. T. boiler with a flat-top Dutch oven and the entire setting inclosed in steel lined with asbestos, and a 250-horsepower H. R. T. boiler with an extended Dutch oven. The duration of tests varied from 5.7 to 8 hours, the average being 7.3 hours. The best efficiency was shown by the second outfit. Of the three boilers this one had the smallest combustion volume. The third outfit with twice the combustion space was second in efficiency. "The results of the tests, though perhaps not absolutely conclusive, at least point to a reasonable doubt as to the necessity of very large and elaborate furnaces. . . . Too much can not be said about the importance of care in operating bagasse furnaces, especially as regards uniformity of bagasse feed, clean fires, and clean heating surfaces."

See also a previous note on this subject by Deerr (E. S. R., 30, p. 891).

Agricultural drawing and the design of farm structures, T. E. French and F. W. Ives (*New York: McGraw-Hill Book Co., 1915, pp. VIII+130, figs. 182*).—This text-book is intended primarily for students in agriculture and agricultural engineering, and describes and illustrates the principles and processes involved in the design and drawing of farm structures, including a variety of problems of progressive difficulty. The following chapters are included: Theory and technique, working drawings, farm structures, maps and topographical drawing, pictorial drawing, and construction data. A selected bibliography of related work is appended, which includes, among other things, a number of the bulletins of the U. S. Department of Agriculture and of several state experiment stations.

Plans for dairy barns and milk room, C. L. Stahl (*Dept. Agr. and Immigr. Va., Dairy and Food Div. Bul. 50 (1915), pp. 14, pls. 15, fig. 1*).—This bulletin

contains plans for economical and sanitary dairy barns and milking sheds, with bills of materials.

Practical instructions for building inexpensive stave silos, P. Rowe (*Dept. Agr. and Immigr. Va., Dairy and Food Div. Bul. 48 (1915), pp. 27, figs. 10*).—This, a revision of Bulletin 24 (E. S. R., 29, p. 789), is a popular description of the construction of stave silos.

Building concrete silos, C. D. Gilbert (*Concrete-Cement Age, 7 (1915), Nos. 1, pp. 3–6, 37, 38, figs. 11; 2, pp. 58–62, 82, 83, figs. 21*).—It is the purpose of these two articles to consider briefly the advantages of various types of silo construction from the viewpoint of its development in different localities and under varying conditions and also to consider the common features of all silo work.

The first article deals with unit construction with blocks and staves, and the second with monolithic construction and types of equipment. A special feature discussed under monolithic construction is the silo water tank.

Electric light and power for country homes, D. L. Markle (*Ann. Rpt. Penn. State Col. 1912, pp. 101–111, pls. 16*).—This article describes the methods and apparatus used in generating electrical power for farm use, especially for lighting.

Illuminating power of kerosenes used in Iowa, W. Kunerth (*Proc. Iowa Acad. Sci., 21 (1914), pp. 241–254*).—The substance of this article was noted from a previous report (E. S. R., 32, p. 487).

A study of methods of sewage disposal in industrial and rural communities and suggestions for their improvement, J. F. Siler, P. E. Garrison, and W. J. MacNeal (*Amer. Jour. Pub. Health, 5 (1915), No. 9, pp. 820–832*).—This paper reviews briefly the usual methods employed for the disposal of human excreta in industrial and rural communities in the South, and discusses in detail methods of actual improvement, the cost thereof, and the benefits derived therefrom.

It is pointed out that in southern rural districts about half the population is without any provision for the disposal of excreta. "In industrial communities open surface privies are most usual, water-carriage systems rare. Complete water systems and sewage-disposal plants can be installed in cotton-mill villages at an expense varying from \$210 to \$265 per house. A rental charge of \$1 to \$2 per house per month for such improvement would suffice to maintain it and also yield a small interest return on the investment."

Brief notes of experiments in sewage purification by forced aeration, J. P. Wakeford (*Surveyor, 48 (1915), No. 1228, pp. 132, 133*).—From the results of experiments on both a large and a small scale it is concluded that the practical application of the aeration principle of sewage purification will improve sanitary conditions with less extensive equipment and a reduction in capital and maintenance costs, and that the residual sludge, owing to the ease with which it can be handled and its high nitrogen content, will be more readily converted into a valuable fertilizing agent.

RURAL ECONOMICS.

Studies in the land problem in Texas, edited by L. H. Haney (*Bul. Univ. Tex. No. 39 (1915), pp. 181, figs. 2*).—This bulletin contains the following papers: The Land Problem in Texas, and The Single Tax, by L. H. Haney; The Recent Increase in Tenancy, its Causes, and Some Remedies, by W. E. Leonard and E. B. Naugle; A Study in the Size of Farms in Texas, by J. G. Grissom; Housing Conditions among Tenant Farmers, by G. S. Wehrwein;

Improved Systems of Tenancy, and Suggestions for a Good Rent Contract, by C. Gardner; Overhaul the Homestead Law, by R. Baker; The Torrens System of Land Registration, by V. Lanfear; State Aid to Land Purchase, by C. Lohman; Conservation of the Mineral and Lumber Resources of Texas, by J. W. Scott; Conservation of Water Resources in Texas, by E. C. Nelson; The Public Lands—A Problem in Administration, by H. H. Baker; The Taxation of Mineral Lands, by A. M. Steiner; Taxation of Rural Lands in Texas, by A. Wight; and Urban Land Tax Reform Schemes, and the So-called "Houston Plan," by J. Runge.

The agrarian problem [of Mexico], R. ESCOBAR (*El Paso, Tex.: M. Ayala e Hijos, 1915, pp. 216*).—The author has outlined what he considers the principal agricultural problems of Mexico and suggests methods of solving them. Suggested legislation necessary to accomplish his purpose is included.

Land tenure and conveyances in Missouri, M. O. HUDSON (*Univ. Missouri Bul. 16 (1915), No. 16, pp. 3–23*).—These pages are devoted to the methods of holding and transferring land under the existing laws of Missouri. The subject is treated from the legal point of view.

The Torrens System, A. G. CAMERON (*Boston and New York: Houghton Mifflin Co., 1915, pp. XI+122*).—This book contains a brief historical description of the spread of the Torrens system of land registration in various countries and gives reasons for its wider adoption in the United States.

Agricultural credit legislation and the tenancy problem, G. E. PUTNAM (*Amer. Econ. Rev., 5 (1915), No. 4, pp. 805–815*).—The author states that although there are considerable differences in the proposed machinery for the administration and supervision of agricultural credit, all contain plans looking toward a longer term of loans, repayable by amortization, and the issuance of bonds on the collective security of farm mortgages. The chief differences are to be found in the effect which these measures are expected to have on the farmer's rate of interest. One type seeks merely to reduce a portion of the waste in the present land credit system by improving the method of making loans and by giving greater mobility to funds seeking safe investment; the other contemplates, in addition, a material reduction in the farmer's rate of interest either through the organization of a strong central bank or through a program of minimum state aid.

Among the reasons cited for the general activity of state legislatures is that with the practical exhaustion of the supply of free land the farmer who aspires to land ownership is now obliged to depend upon his borrowing power with the various financial institutions rather than upon the generosity of the Federal Government. At present, about the longest term of loan allowed by commercial banks on farm mortgage security is five years, which is deemed far too short a period for the payment of a loan out of the product of land. The method of repayment is also haphazard, the possibility and conditions of renewal uncertain, and expenses much higher than farm mortgage security under a specialized and mobile system of land credit would warrant.

It is claimed that a reform in the land credit system which reduced the rate of interest on long-time loans would effectively curtail the growth of farm tenancy in this country by making it possible for a young man of small means eventually to become a landowner. The author therefore believed that if a reform in the land credit system is to be the initial step in reducing the percentage of farm tenancy, some measures should be taken to prevent the general rise in land values that would normally follow. One of the functions of laws enacted by the legislatures should be the formation of companies so super-

vised and regulated as to afford a reasonable degree of security to the holders of land mortgage bonds.

The author concludes his paper by stating that in so far as the reason for rural credit reform is to be found in the increasing percentage of farm tenancy, the larger program of direct aid is one to be instituted by the Federal Government. He considers it as logical for the Federal Government to grant special aid to the young man desiring to own a farm as to adopt the free land policy which made ownership rather than tenancy the characteristic form of land tenure in this country.

How to build up a neglected farm business with little capital, H. SMITH (*Oreg. Countryman, 8 (1915), No. 2, pp. 77–81, figs. 2*).—The author has outlined a system of farming for conditions as found in the Willamette Valley, whereby the farmer can change from grain farming to farming in which live stock and legumes predominate.

Agricultural surveys and illustration farms, F. C. NUNNICK (*Com. Conserv. Canada Rpt., 6 (1915), pp. 210–222, pls. 2*).—The author has briefly outlined his observations regarding farm practice in various parts of Canada and the results obtained on the illustration or demonstration farms.

Work of the Office of Markets and Rural Organization, C. J. BRAND (*U. S. Dept. Agr., Office Markets and Rural Organ. Doc. 1 (1915), pp. 16*).—The work of this Office as organized is outlined and briefly described.

The work of the [New York State] Department of Foods and Markets, J. J. DILLON (*Cornell Countryman, 13 (1915), No. 3, pp. 193–197, figs. 4*).—An account is given of the work of this department, through which it is hoped to find a profitable market for the food products of the farm, and through economic distribution to help reduce the high cost of city living. The principal service thus far performed has been in conducting auctions in the sale of fruit in the producing areas as well as at the consuming centers. The results claimed are an increased price to growers and a reduction in the loss of soft and low-grade fruits by getting such grades upon the market quickly.

International annual of agricultural statistics, 1913–14 (*Inst. Internat. Agr. [Rome], Ann. Internat. Statis. Agr., 1913–14, pp. XLIV+786*).—This continues information previously noted (E. S. R., 33, p. 295), adding statistical data for later years.

[Live stock in foreign countries] (*Internat. Inst. Agr. Rome, Bul. Agr. and Com. Statis., 6 (1915), No. 10, pp. 556–559*).—These pages contain statistical data for the number of live stock in France on July 1, 1915, in Great Britain and Ireland in June, 1915, in Luxemburg on May 26, 1915, and in Canada on June 30, 1915, and the number of sheep in New Zealand on April 30, 1915. Comparative data are shown for earlier years.

[Agricultural statistics of Canada] (*Canada Yearbook, 1914, pp. 140–221, pl. 1*).—The area, yield, weight per measured bushel, average price, and total value of the principal field crops, and the number of live stock, are given by Provinces for 1910–1914. The total area in farms, total number of farms, area improved and unimproved, and area devoted to specific agricultural purposes, are given for 1901 and 1911; cold-storage warehouses, their capacity, and types of produce stored, for 1915; and the average cost of production, value, and profit per acre of wheat, oats, barley, flax, and corn for husking, are given for Canada as a whole and by Provinces for 1913. The average wages of farm help are given for 1910 and 1914, showing the wage for males and females per month, in the summer season including board, per year including board, and the average value of board per month. The distribution of the wheat crop for the crop years 1910–11 to 1914–15, showing the total yield and distribution of the grain,

and the average weekly range of prices of agricultural products at the principal markets, are also given.

The agricultural industry in its relation to other industries, G. S. Pérez (In *Primera Semana Social Agricola. Santiago de Chile: Universidad Católica de Santiago, 1914, pp. 294–304*).—The author discusses the relative importance of agricultural products in the foreign trade and in the manufacturing industries of Chile.

Exportation of agricultural products, E. Carrasco (In *Primera Semana Social Agricola. Santiago de Chile: Universidad Católica de Santiago, 1914, pp. 261–293*).—The author describes briefly the agricultural possibilities of Chile, suggests the formation of agricultural colonies by the introduction of European immigrants, the improvement of the system of agricultural instruction, and the appointment of commercial agents to determine the best methods for preparing the farm products for market.

Prices and supplies of corn, live stock, and other agricultural produce in England and Wales (*Bd. Agr. and Fisheries [London], Agr. Statis., 49 (1914), No. 3, pp. 186–273*).—This bulletin continues data previously noted (E. S. R., 31, p. 790), adding statistics for 1914.

Production and consumption of products of state-controlled industries in Denmark, 1913, 1914 (*Danmarks Statis. Meddel., 4. ser., 45 (1915), Nos. 1, pp. 31; 6, pp. 32*).—These reports contain data showing for alcohol, beer, sugar, margarin, and cigars the quantity produced, materials used in production, home consumption, and foreign trade for 1913 and 1914.

Agricultural statistics of India, 1912–13 (*Agr. Statis. India, 29 (1912–13), I, pp. IX+415, pls. 4*).—This annual report gives statistical data regarding the area cultivated and uncultivated, area under irrigation and under different crops, and number of live stock, plows, and carts, by districts, for the crop years 1908–9 to 1912–13.

AGRICULTURAL EDUCATION.

Technical education in tropical agriculture (*Proc. Internat. Cong. Trop. Agr., 3 (1914), pp. 40–51, 62–70*).—These proceedings include a discussion by W. R. Dunstan of the proposed Imperial College of Tropical Agriculture (E. S. R., 32, p. 100); and brief abstracts of papers presented at this congress on Technical Education in Tropical Agriculture, by G. C. Dudgeon; The Study of Colonial Agriculture in Italy, by G. B. Gioli; The Necessity of Establishing a British Agricultural College in the Western Hemisphere, by H. H. Smith; Agricultural Education and Its Adjustment to the Needs of the Students, by F. Watts; and Elementary Agricultural Schools for Natives in the Belgian Congo, by E. Leplae. A discussion follows.

Agricultural instruction in schools (*Agr. Gaz. Canada, 2 (1915), No. 10, pp. 1002–1006*).—Brief reports are given on the status of agricultural instruction in the secondary schools of Nova Scotia, Manitoba, Saskatchewan, and Alberta.

On the reform of the final examinations of the intermediate agricultural schools (Mittelschulen), F. Sitenský (*Land u. Forstw. Unterrichts Ztg., 29 (1915), No. 1–2, pp. 1–8*).—The author advocates a reform of the final examinations in intermediate agricultural schools in Austria so that they will be not merely memory tests but rather opportunities for candidates to demonstrate their ability to think and calculate practically and independently. Present regulations require students to be examined orally and in writing in plant and animal production, agricultural machinery and implements, and farm

management. For many years the agricultural intermediate schools of Bohemia have required students of the third year to prepare a plan of organization of a farm with which they are familiar. The author thinks it preferable to include this, in less detail, in the actual examination, and to make it form the basis of the oral examination in the other branches. He also recommends that prospective students acquire a practical experience of at least one year before entering these schools.

The equipment and work of the Lower Austrian Agricultural Education Institute at Obersiebenbrunn, V. GÖHLERT (*Land u. Forstw. Unterrichts Ztg., 29 (1915), No. 1–2, pp. 9–18, fig. 1*).—This is a description of the buildings, equipment, and instruction in agriculture and home economics of this school which was opened November 16, 1914. The school offers (1) 2 consecutive 5 months' winter courses for farmers' sons who have completed the elementary school, 15 hours a week being devoted to practical work out of a total of 33 hours in the first semester and 31 hours in the second semester, (2) 3 months' courses in the spring and fall in cookery, housekeeping, and agriculture for farm girls who have completed the elementary school, and (3) special courses of one or more days for adults. Similar schools have been established at Pyhra and Bruck, the latter to take the place of the school at Trautmannsdorf.

Report of the department of agriculture of Sweden, 1912 (*K. Lantbr. Styr. [Sweden] Underdåniga Ber. 1912, pp. [8]+606*).—This report contains the usual accounts of the various agencies for the promotion of Swedish agriculture, including reports of the work of agricultural, horticultural, dairy, and housekeeping schools, and dairy, chemical, and seed control stations.

Agricultural and technical education (*Netherlands East India-San Francisco Com., Dept. Agr., Indus. and Com., Essay No. 7 (1914), pp. 47, pls. 10*).—This essay includes a review of the development and present status of agricultural instruction in the Dutch East Indies, comprising the work of agricultural officials and instructors, demonstration fields, government and private elementary agricultural schools, agricultural instruction in the training schools for native teachers, lecture courses for employed teachers, the Higher Agricultural School at Buitenzorg, the native Veterinary School at Buitenzorg, a course of instruction for cattle and meat inspectors, the secondary agricultural school known as the School of Cultivation, at Soekaboemi, Java, and the information service for native agriculture.

The work of educated women in horticulture and agriculture, MRS. R. WILKINS (*Jour. Bd. Agr. [London], 22 (1915), Nos. 6, pp. 554–569; 7, pp. 616–642*).—This report is the outcome of an inquiry made by the Women's Farm and Garden Union for the purpose of ascertaining what openings exist for educated women to take up some form of agricultural or horticultural work as a profession. It discusses the training available to women in the various branches of horticulture and agriculture, prospects for subsequent employment, and data on the training, experience, and success or failure of women actually engaged in agricultural and horticultural work.

It is found that in horticulture, until the outbreak of the war, salaried positions were limited in number and salaries were low relatively to the expense of training and did not admit of saving for illness or old age. Putting aside those who have set up on their own account, a few of whom have struck out along new lines and done well, practically none was making an entire living without the aid of pupils, but those who started under proper conditions were supplementing small incomes and leading the outdoor life which they prefer. The same conclusions were also drawn as to farming on a small scale, in normal times there being practically no salaried positions at a living wage for educated women in farming.

In dairy and poultry work the training can be obtained at the least expense and for the lower positions in less time, but the better paid positions are fewer in proportion and require long experience. Poultry farming is carried on successfully by many women, but is deemed a very risky occupation for anyone without proper experience. Quite a number of women with certain qualifications and sufficient training are supplementing a small income or making a living after having invested their small capital. Others who have not invested all their capital in the business but retain a small private income are not involved in a struggle for bare existence, having their own homes, living an independent life, and enjoying many advantages such as healthful surroundings, fresh garden and dairy produce, etc.

Experiments in elementary agriculture, W. H. Davis (*Cedar Falls, Iowa: S. E. Green & Co., 1915, pp. 76*).—This is a compilation of 113 exercises in plant propagation, growth, and diseases, soils, dairying, and poultry raising. The pupil is required to state the object of each experiment, follow the operations indicated, and give his conclusions. References to pertinent literature are included.

Preparation of agricultural exhibits, J. D. Marshall, J. A. Helmreich, E. P. Sandsten, and Inga M. K. Allison (*Colo. Agr. Col., Ext. Ser. No. 103, pp. 16, figs. 9*).—The authors offer suggestions on the selection and preparation of material for agricultural, live stock, fruit and vegetable, and household exhibits.

School exhibits and contests, D. H. Doane (*Mo. Col. Agr., Agr. Ext. Serv. Proj. Announcement 4 (1915), pp. 26*).—This circular outlines and classifies home economics, school, agricultural, and athletic exhibits and contests for country and small town school children between the ages of 10 and 18 years at district, township, and county meetings. General explanations and rules governing these exhibits and contests, a list of references to literature, and sample forms are also given.

Boys' and girls' field-crop competitions in connection with farmers' institutes, J. C. Readey (*Brit. Columbia Dept. Agr. Bul. 62 (1915), pp. 19, figs. 3*).—This bulletin contains instructions on potato growing and rules and regulations, score cards, and prize lists for the boys' and girls' potato competitions in British Columbia.

MISCELLANEOUS.

A report on the work and expenditures of the agricultural experiment stations during the fiscal year ended June 30, 1914 (*U. S. Dept. Agr., Rpt. Work and Expenditures Agr. Expt. Stas., 1914, pp. 289, pls. 8*).—This includes the usual report on the work and expenditures of the agricultural experiment stations in the United States, including Alaska, Hawaii, Porto Rico, and Guam, together with detailed statistics compiled from official sources as to the organization, lines of work, revenues, additions to equipment, and expenditures of the stations.

The total income of the stations during 1914 was $5,164,687.96. Of this amount $712,649.08 was derived under the Hatch Act, $713,517.91 under the Adams Act, $2,574,605.27 from State appropriations, $19,784.87 from individuals and communities, $234,794.67 from fees, $307,615.40 from farm products, and $491,756.76 from miscellaneous sources. In addition, the Office of Experiment Stations had an appropriation of $461,260, including $35,000 for the Alaska Stations, $30,000 each for the stations in Hawaii and Porto Rico, and $15,000 for the Guam Station. The value of additions to the equipment of the stations was estimated at $1,012,370.71, of which $609,199.92 was for buildings.

The stations employed 1,852 persons in the work of administration and inquiry. Of this number 905 were also members of the teaching staff of the colleges and 590 assisted in farmers' institutes. During the year the stations published 1,330 annual reports, bulletins, and circulars, aggregating 25,265 pages, and these were distributed to 1,049,339 addresses on the regular mailing list.

An index has been added to the report.

Thirty-fourth Annual Report of Ohio Station, 1915 (*Ohio Sta. Bul. 288 (1915), pp. XXXIV, pl. 1*).—This contains the organization list, a financial statement for the fiscal year ended June 30, 1915, and a report of the director summarizing the work and publications of the station during the year. The text of recent state legislation affecting the station is included.

Twenty-seventh Annual Report of Texas Station, 1914 (*Texas Sta. Rpt. 1914, pp. 34*).—This contains the organization list, a financial statement for the federal funds for the fiscal year ended June 30, 1914, and for various state funds for the fiscal year ended August 31, 1914, and a report of the director on the work of the station and the various substations.

Monthly bulletin of the Western Washington Substation (*Washington Sta., West. Wash. Sta., Mo. Bul., 3 (1915), Nos. 8, pp. 16, figs. 4; 9, pp. 16, fig. 1*).—These numbers contain brief articles on the following subjects:

No. 8.—Experimental Spraying for Blackberry Anthracnose, by H. L. Rees (see p. 445); Soils of Western Washington, by E. B. Stookey (see p. 418); Selected Potato Seed, by J. L. Stahl; and Winter School for Farmers, by W. A. Linklater.

No. 9.—The Winter School, by W. A. Linklater; Developing the Small Dairy Farm, by H. L. Blanchard; Water Holding Capacity of Soils, by E. B. Stookey; Hotbeds and Cold Frames, by J. L. Stahl; and Loafing [by Poultry], by Mrs. George R. Shoup.

Press Bulletins (*Ohio Sta. Bul. 228 (1915), pp. 373–377*).—Reprints of press bulletins on feeding cheap wheat, the army worm, preparing for white grubs, the potash supply, and ashes and hen manure.

Relation of the agricultural college and experiment station libraries to the Library of the Federal Department of Agriculture, CLARIBEL R. BARNETT (*Bul. Amer. Libr. Assoc., 9 (1915), No. 4, pp. 156–159*).—This address explains the general policy of the Library of the U. S. Department of Agriculture with reference to interlibrary loans, exchange of duplicates, preparation of bibliographical information relating to the literature of agriculture, and assistance in the organization of agricultural libraries.

The relation between the agricultural college libraries and the extension work of the country as developing under the Smith-Lever Act, D. W. WORKING (*Bul. Amer. Libr. Assoc., 9 (1915), No. 4, pp. 153–156*).—This address briefly discusses some advantages of cooperation between agricultural college libraries and extension workers.

Yearbook of natural science, 1913–14, edited by J. PLATZMANN (*Jahrb. Naturw., 29 (1913–14), pp. XVIII+445, pls. 19, figs. 49*).—This summary of the year's progress includes sections on chemistry (pp. 29–68), by K. Dammann; meteorology (pp. 89–107), by E. Kleinschmidt; zoology (pp. 141–166), by H. Reeker; botany (pp. 167–202), by J. E. Weiss; and forestry and agriculture (pp. 203–238), by F. Schuster.

A theory of gravitation and related phenomena, W. J. SPILLMAN (*Lancaster, Pa.: The New Era Printing Co., 1915, pp. 26, figs. 12*).—A theory is suggested and discussed.

NOTES.

Alabama College and Station.—William J. Robbins (Ph. D., Cornell University) has recently been appointed professor of botany in the college and plant physiologist in the station, succeeding Dr. J. S. Caldwell, whose resignation has been previously noted.

Arizona University and Station.—A cooperative agreement has been arranged with the Bureau of Plant Industry of this Department, whereby E. W. Hudson of that Bureau has been appointed Egyptian cotton specialist in the extension division with headquarters at Tempe. He will spend part of his time in demonstration and advisory work in Maricopa County in connection with the growing of Egyptian cotton, the remainder being still devoted to the breeding and cultural work for this Department.

Leonhardt Swingle, assistant in plant breeding, resigned February 1 to engage in commercial work on a large citrus farm in southern California. H. C. Heard, who has been engaged in agricultural work for an Oregon corporation, has been appointed assistant in agonomy beginning March 1.

Hawaii Federal Station.—Miss Alice R. Thompson was transferred March 1 to the Bureau of Chemistry of this Department for one year.

Idaho University.—Attendance at the farmers' and homemakers' week in January reached a high-water mark of over 400. Special interest was evidenced in dairying and live stock questions.

Purdue University.—A stock show was recently held in the judging pavilion, primarily for the purpose of exhibiting the stock prepared for the International Live Stock Exposition. The various groups were judged by the students and their ratings subsequently corrected and explained. Much interest was aroused and it is deemed possible that the show may be held annually.

J. H. Lloyd, instructor in agronomy, has been appointed agricultural advisor for Hancock County, Illinois.

Iowa College.—A collegiate course in farm management is being offered for the first time. This course adds a year of practical work to the regular college course. The practical work is under the supervision of the college and no degrees are given until the requirements are fully met. The object of the course is to provide special training for prospective farm managers, farm demonstrators, and county agents.

Despite inclement weather the farmers' short course and convention week, January 31 to February 5, attracted an attendance of about 3,000. This was the largest number yet recorded and taxed accommodations at several points. A new feature was the farmers' annual banquet, which proved very popular. Especial attention was given to the boys and girls, of whom about 300 were in attendance.

Kansas Station.—George K. Helder, superintendent of the Fort Hays substation, has resigned to engage in private business, and was succeeded March 15 by Charles R. Weeks, professor of agriculture and extension and college farm inspector at the Winthrop Normal and Industrial College.

Kentucky University and Station.—Walter Scheppelman, inspector of bakery sanitation, resigned January 1, and J. H. Carmody, assistant professor of horticulture in the extension department, March 1. C. E. Rogers succeeded Robert Pfanstiel as assistant in the department of chemistry in February, and Angus Gordon succeeded D. S. Myer as instructor in the department of agronomy February 1.

Louisiana Stations.—E. J. Watson, horticulturist at the North Louisiana Station for about 20 years, has resigned to become agricultural commissioner for the Prescott and Northwestern Railroad Company.

Maine Station.—Michael Shapovalov, assistant in plant pathology, has been appointed collaborator with the Bureau of Plant Industry of this Department beginning February 15.

Massachusetts College.—The new microbiology building is expected to be ready for occupancy April 1. The portion of this building now completed will cost about $67,000, and is expected to be enlarged by a 100-foot extension to be used as a physics building.

A prize of $50 was recently awarded to a member of the senior class for the best rural drama by an undergraduate student. The title of the winning play was The Craftsman of the Soil, and the purpose in view was the correct presentation of various phases of the rural problem.

Minnesota University.—The short courses, January 3 to 8, were attended by about 1,250 farmers and homemakers. A state federation of farmers' clubs to act as a service bureau and to promote but not transact cooperative business was organized, with provision for an annual convention during the short courses.

Nevada Station.—A number of poultry houses and yards have been completed for further studies of contagious epithelioma and other chicken disorders.

New Jersey College and Stations.—The American Berkshire Congress met on the station grounds February 22–24. Allen G. Waller, assistant in farm crops, has been appointed extension specialist in agronomy.

North Carolina College and Station.—It is announced that President D. H. Hill has resigned, after 26 years' service, to devote himself to historical work.

The formation of credit unions in the State under the supervision of the chief of the division of markets of the station is being carried on with much success. Seven unions have now been established and are beginning work. E. E. Culbreth, a graduate of the college and with six years' local banking experience, has been appointed examiner of credit unions in connection with their subsequent operations.

Thomas C. Reed, instructor in dairy husbandry at the University of Missouri and assistant in that station, has been appointed associate professor of dairy husbandry, beginning June 1 and relieving Prof. D. T. Gray of all teaching work in dairying.

North Dakota College.—Dr. J. H. Worst has retired from the office of president to become president emeritus. Prof. E. F. Ladd has been appointed president.

Ohio State University.—The attendance at the annual farmers' week aggregated 2,892 men and women, an increase of 98 per cent over the previous year. Every county in the State was represented, as well as 22 other States and 2 foreign countries. The average age was 39 years, and 80 per cent of the men were directly from farms. The large attendance and success of the meetings is attributed in part to the active cooperation of several state agricultural associations, including the dairymen, fruit growers, stock breeders, and grain farmers, as well as commercial interests, the agricultural press, grange, and others.

Arthur G. McCall, head of the department of agronomy, has accepted a position at the Maryland Station in charge of soil investigations, beginning in June.

F. L. Allen, county agent for Geauga County, has been appointed state supervisor of institutes and schools, a new position in the extension service, beginning March 1.

Oregon College and Station.—The construction of the new forestry building has been authorized and advertisements for bids have been issued. The structure will be 80 by 140 feet and three stories high, and will cost about $40,000. In type it will resemble the agricultural and home economics buildings. A large laboratory for logging engineering and several smaller laboratories for studies of manufactures of wood products will be located on the first floor, with offices, classrooms, and other laboratories on the second and third floor. The building is expected to be completed for use by next September.

A 2-year course in news writing has been authorized to train students in writing news technical to agriculture, home economics, and home engineering. This is designed mainly to help qualify students for extension work.

Four additional counties, viz, Multnomah, Wasco, Yamhill, and Josephine, have made provision for maintaining the work of county agriculturists. Multnomah County contains the city of Portland and its population comprises more than one-third of that of the entire State. Almost one-half of the counties of Oregon now maintain county advisors.

M. S. Shrock, until recently deputy state dairy and food commissioner, has accepted an appointment as county agriculturist of Yamhill County. George F. Moznette has been appointed assistant entomologist, Paul S. Lucas, dairy inspector, Marion B. McKay, of the Bureau of Plant Industry of this Department, research assistant in botany, and Charlotte Hurd, instructor in home economics. Two-year leaves of absence have been granted to E. J. Kraus, research specialist in horticulture, and H. V. Taylor, associate professor of agricultural chemistry and station chemist.

Pennsylvania College and Station.—J. F. Adams, assistant professor of botany, has been granted leave of absence until September 1 to pursue graduate work at Columbia University. E. A. Siegler, assistant in botany, resigned January 1 to accept a position with this Department. Russell W. Duck, assistant in animal husbandry, resigned February 9 to accept a position with the animal husbandry department at Syracuse University, and has been succeeded by G. H. Grabe.

South Carolina Station.—C. A. McLendon has resigned as field pathologist to accept a position as expert in cotton breeding with the Georgia State Board of Entomology, beginning February 1.

Texas College.—The contract has been let for a new dairy barn to cost $10,000. Plans are being drawn for a new animal husbandry building to cost $40,000, a new hog cholera serum plant to cost $15,000, a veterinary building to cost $100,000, and an auditorium to cost $100,000.

Utah College.—President John A. Widtsoe has been appointed president of the State University, vice J. T. Kingsbury resigned, to take effect next September. Dr. E. G. Peterson, director of agricultural extension, has been appointed to succeed Dr. Widtsoe as president of the college.

Virginia College and Station.—Robert J. Davidson, professor of agricultural chemistry since 1891, chemist from 1891 to 1907, and dean of the scientific department since 1903, died December 19, 1915, at the age of 53 years. He had long been a prominent figure in the Association of Official Agricultural Chemists, serving as president in 1903 and as a member of various important committees. He was also a fellow of the American Association for the Advancement of Science.

Wyoming University and Station.—The wool exhibit car, equipped with samples of wool and woolen fabrics, different types of wool-producing sheep, etc., visited advantageous wool-producing points in the State during February and

March. The car is proving the most efficient and popular method of instruction and demonstration yet undertaken. During the past month the number of inquiries for information received from farmers, ranchmen, and stockmen has been noticeably greater than heretofore.

Experimental Work in Dairying in Pennsylvania.—The Dairy Division of this Department is carrying on experimental work in creamery problems at a plant at Grove City, Pa., where a two-story building, 36 by 70 feet, has been erected by a local stock company. The first floor of the building is used for practical creamery operations and the second for laboratories. In addition to butter investigations the work will include studies of the utilization of by-products by the manufacture of casein, cottage cheese, milk sugar, condensed skim milk, etc., and the disposal of creamery wastes.

Canadian Experimental Farms.—The new building for the division of cereals and agrostology at the Central Experimental Farm to replace the structure burned last July is nearing completion. It is a two-story and basement building 40 by 90 feet. The main floor is used for the handling of seed grain, while the second floor contains milling and baking rooms, a plant inspection room, and quarters for the work in agrostology.

Manitoba Agricultural College.—A. J. Galbraith and William Southworth, of the Ontario Agricultural College, have been appointed specialists in soil survey and plant breeding respectively. F. S. Jacobs, until recently editor of the *Farm Journal*, has been appointed professor of animal husbandry, and E. W. Wood, a county agent of North Dakota, lecturer in animal husbandry.

Closing of Agricultural College at Uckfield, England.—The agricultural college at Uckfield, England, has been closed by the East Sussex County Council on the ground of economy. This action is strongly deprecated in a recent issue of *Nature*, which calls attention to some of the difficulties which would be confronted in reopening the institution. The point is also made that the college had received considerable grants from the British Treasury, so that "the very important question is raised whether an educational committee of a county council ought to have the power to close an institution subsidized by the State and whether the State ought not to have the power of veto."

Agricultural Instruction for Interned Soldiers.—According to a note in *Nature* courses of instruction in agriculture have been begun at Harderwÿk, Holland, among the interned Belgian soldiers, and with Prof. Antoine of Louvain University in charge. Lectures are being given in elementary botany, chemistry, surveying, general agriculture, plant diseases, agricultural machinery, and zootechny, and courses in dairying, horticulture, and forestry are contemplated.

Animal Disease Investigations of the Rockefeller Institute.—A tract of 400 acres of land has been purchased near Princeton, N. J., at a cost of about $100,000, and a laboratory for the study of animal diseases is under construction with a view to completion during 1916. It is expected that about $1,000,000 will ultimately be required for the construction and equipment of the laboratory. The research work is now being carried on at Princeton University under the direction of Dr. Theobald Smith, with Dr. Karl Ten Troeck as associate in the department of animal pathology and Dr. R. Werner Marchand as assistant.

American Society of Agricultural Engineers.—The ninth annual meeting of this society was held in Chicago December 28–30, 1915. The presidential address by H. H. Musselman, of the Michigan College and Station, pointed out the need for an agricultural engineer's handbook to supply data on the power requirements of farm machinery, lighting, and heating problems, water supply, and sewage disposal. A committee was appointed to organize available material into such a handbook.

One session of the convention was devoted mainly to a discussion of modern farm conveniences, another to tractor development, and a third considered fences, problems for agricultural engineering research, and courses in agricultural engineering.

Officers were elected as follows: President, F. M. White of the Wisconsin University and Station; vice-presidents, Spencer Otis and M. M. Baker of Illinois; and secretary-treasurer, C. G. Shedd of the Iowa College.

Necrology.—Henry Wallace, widely known as the founder and editor of *Wallaces' Farmer*, died Februray 22 at Des Moines, Iowa, at the age of 80 years. Dr. Wallace was educated for the ministry and served as pastor of several Iowa churches, retiring in 1877 on account of impaired health. He then took up farming and writing for the rural press, and in 1883 became editor of the *Iowa Homestead*. In 1895 he founded, with his two sons, *Wallaces' Farmer*, and continued as its editor until his death, wielding wide influence in this position. He also served as a member of the Commission on Country Life, appointed by President Roosevelt in 1908, as president of the National Conservation Commission in 1910, and, together with former Secretary of Agriculture James Wilson, made a study in 1913, under an appointment from the Governor of Iowa, of agricultural conditions in Great Britain.

The death is reported of A. D. Darbishire, demonstrator of zoology and lecturer on genetics in the University of Edinburgh, while serving with the English Army in France. He will be remembered in this country as a lecturer at the last Graduate School of Agriculture, at Columbia, Missouri, July, 1914, his subject being An Attempt to Estimate the Value of the Mendelian Method as an Instrument for the Improvement of the Animals and Plants which are Serviceable to Mankind.

Dr. Paul Sorauer, of the University of Berlin, well-known for his work on plant diseases, his *Handbuch der Pflanzenkrankheiten*, the last edition of which was issued in 1911, and as editor of *Zeitschrift für Pflanzenkrankheiten* since its establishment in 1891, died recently, aged 77 years.

New Journals.—*Soil Science*, a monthly journal devoted to problems in soil physics, soil chemistry, and soil biology, is being published at Rutgers College with Director J. G. Lipman as editor-in-chief, N. Kopeloff and C. R. Woodward as assistant editors, and the following board of consulting editors: F. J. Alway, C. Barthel, M. W. Beijerinck, A. W. Blair, P. E. Brown, H. R. Christensen, H. J. Conn, H. von Feilitzen, E. B. Fred, R. Greig-Smith, B. L. Hartwell, C. B. Lipman, F. Löhnis, T. L. Lyon, E. A. Mitscherlich, C. A. Mooers, T. Remy, G. Rossi, E. J. Russell, O. Schreiner, A. A. F. de Sigmond, C. E. Thorne, and N. Tulaikoff. The initial number is dedicated to Dr. E. W. Hilgard, and contains a tribute to his memory, an introductory statement by Director Lipman, and the following original articles: A Detailed Study of Effects of Climate on Important Properties of Soil, by C. B. Lipman and D. D. Waynick; The Influence of Some Common Humus-forming Materials of Narrow and Wide Nitrogen-carbon Ratio on Bacterial Activities, by P. E. Brown and F. E. Allison; Carbon and Nitrogen Changes in the Soil Variously Treated—Soil Treated with Lime, Ammonium Sulphate, and Sodium Nitrate, by R. S. Potter and R. S. Snyder; and Effect of Grinding on the Lime Requirement of Soils, by R. C. Cook. It is announced that papers dealing with problems in plant physiology, agronomy, bacteriology, and geology are to be accepted only when they contribute directly to a knowledge of soil fertility.

Genetics, a periodical record of investigations bearing on heredity and variation, is being published bimonthly by an editorial board consisting of Drs. W. E. Castle, E. G. Conklin, C. B. Davenport, B. M. Davis, E. M. East, R. A.

Emerson, H. S. Jennings, T. H. Morgan, and Raymond Pearl, and with Dr. Geo. H. Shull as managing editor. The initial number contains a reproduction of a hitherto unpublished portrait of Gregor Mendel, and original articles on Nondisjunction as Proof of the Chromosome Theory of Heredity, by C. B. Bridges; The Numerical Results of Diverse Systems of Breeding, by H. S. Jennings; and Hereditary Anchylosis of the Proximal Phalangeal Joints (Symphalangism), by H. Cushing.

Bollettino di Studi ed Informazioni del R. Giardino Coloniale di Palermo is being issued by the Royal Colonial Garden at Palermo, Italy, primarily for the presentation of the results of its scientific work. This deals with problems in colonial agriculture, especially the introduction and improvement of useful plants. The institution was formerly a section of the Royal Botanical Garden but was given its present status under a decree of August 21, 1913, at which time about $3,500 per annum was made available for its work. An article by Dr. Guiseppe Catalano describes the activities of the institution in detail.

The *Journal of Immunology* has been established as the official organ of the Society for Serology and Hematology and the American Association of Immunologists, and is being published bimonthly. The initial number contains several original articles on anaphylaxis, complement fixation, and the fate of various bodies on the precipitin reaction, and the scientific proceedings of the Society for Serology and Hematology at its meeting held December 3, 1915.

Fermentforschung is being published at Leipsic under the direction of Dr. E. Abderhalden. The initial numbers consist of numerous contributions from various German laboratories on the synthesis of polypeptids, peptones, and proteids by means of enzyms, the Van Slyke method for the determination of amino nitrogen, the chemical nature of catalase, etc.

The Scientific Monthly has been established by the former publishers and editorial management of the *Popular Science Monthly*, and is to be conducted along the lines followed by that journal in recent years. The *Popular Science Monthly* has been acquired by a new management and will be devoted to popularized science for the general public.

The *Journal of Cancer Research* is being published quarterly by the American Association for Cancer Research. The initial number contains several original articles and the proceedings of the 1915 meeting of the association.

Miscellaneous.—*Science* announces that a Vienna manufacturer has given $100,000 to establish an institution for the technical study of nutrition. This institution is to be called the Institut für Volksernährung, and is to correlate the findings of organic chemistry, biology, physiology, etc.

Director T. E. Quisenberry, of the Missouri Poultry Station at Mountain Grove, has resigned to enage in commercial work.

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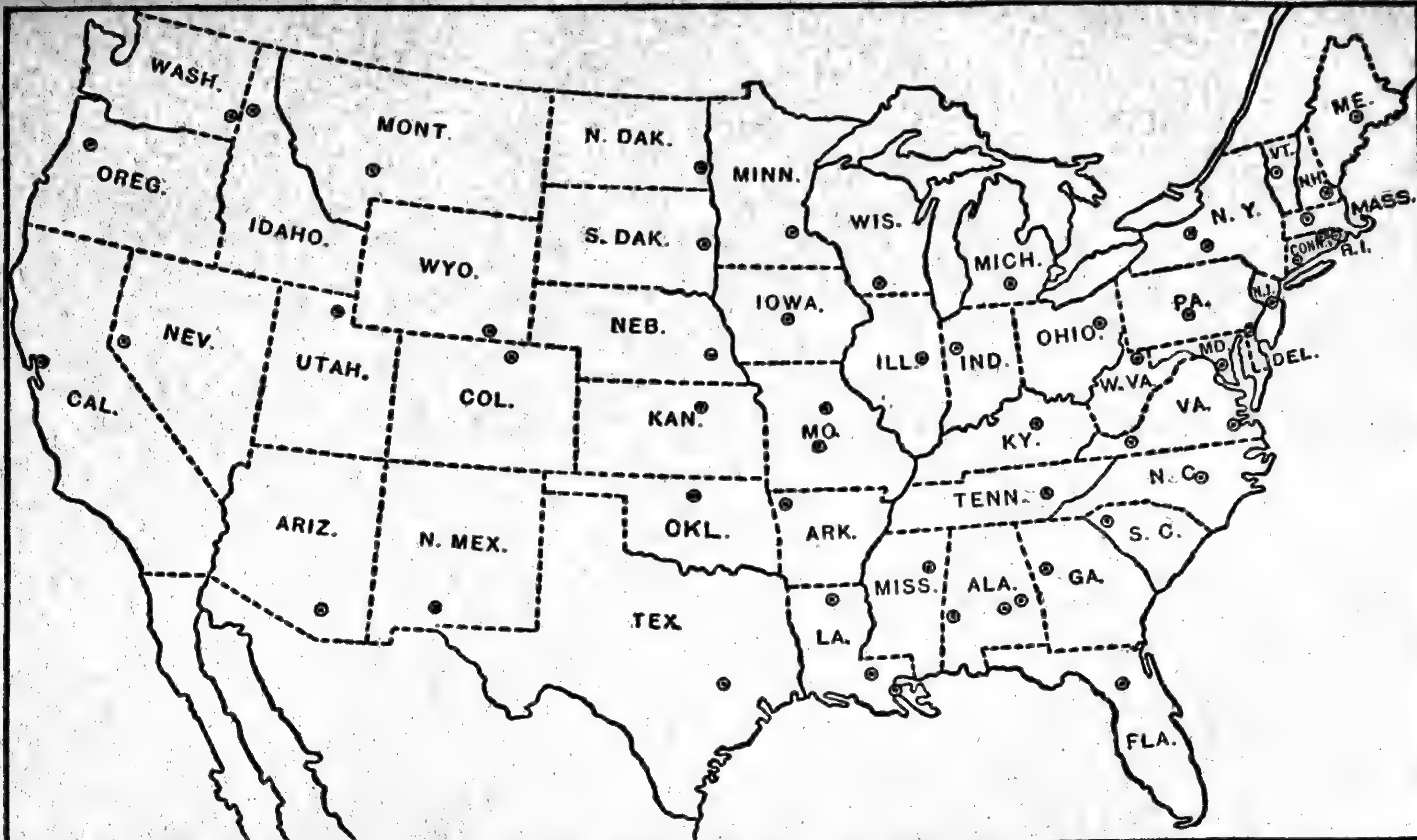

THE AGRICULTURAL EXPERIMENT STATIONS OF THE UNITED STATES.

Issued April 22, 1916.

U. S. DEPARTMENT OF AGRICULTURE

STATES RELATIONS SERVICE

A. C. TRUE, DIRECTOR

Vol. XXXIV ABSTRACT NUMBER No. 6

EXPERIMENT STATION RECORD

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1916

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EXPERIMENT STATION RECORD.

VOL. XXXIV. ABSTRACT NUMBER. No. 6.

RECENT WORK IN AGRICULTURAL SCIENCE.

AGRICULTURAL CHEMISTRY—AGROTECHNY.

Proceedings of the thirtieth annual convention of the Association of Official Agricultural Chemists, 1913 (*Jour Assoc. Off. Agr. Chem., 1 (1915), Nos. 1, pp. IV+168; 2, pp. IV+169–352*).—This is a detailed report of the proceedings of the convention held at Washington, D. C., November 17–19, 1913, previously noted (E. S. R., 29, p. 795).

The character of the water-soluble nitrogen of some common feeding stuffs, E. B. HART and W. H. BENTLEY (*Jour. Biol. Chem., 22 (1915), No. 3, pp. 477–483*).—"The 'amid' nitrogen of feeding stuffs is largely composed of free amino acids and peptid linkings. In most cases the nitrogen in these structures constitutes from 50 to 70 per cent of the water-soluble nitrogen. The acid-amid nitrogen is relatively small, seldom exceeding 20 per cent of the water-soluble nitrogen, and more often being below 10 per cent. Corn stover is an interesting exception, showing approximately 40 per cent of the water-soluble nitrogen in acid-amid form. The ammonia nitrogen rarely exceeded 5 per cent of the total water-soluble nitrogen, and in some instances was wholly absent."

The free amino nitrogen of the different proteins of ox and horse serum, P. HARTLEY (*Biochem. Jour., 9 (1915), No. 2, pp. 269–271*).—The experimental results obtained by the author are in agreement with those of Van Slyke and Birchard as previously noted (E. S. R., 33, p. 201).

On constituents of oil of cassia, F. D. DODGE and A. E. SHERNDAL (*Jour. Indus. and Engin. Chem., 7 (1915), No. 12, pp. 1055, 1056*).—The results of a thorough examination of the oil of cassia showed that it "contained at least 0.5 per cent soluble in dilute alkali, consisting of a mixture of about 25 per cent salicylic aldehyde, 60 per cent coumarin, from 8 to 10 per cent cinnamic acid, and small amounts of salicylic acid, benzoic acid, and a volatile liquid acid not identified. No phenol, other than salicylic aldehyde, could be detected. Although present in small proportion, salicylic aldehyde and coumarin undoubtedly contribute to the composite aroma of the oil. In fact, the presence of the former can be often detected by odor in the first fraction of a redistilled oil."

The oil of the wild grape seed, Vitis riparia, G. D. BEAL and C. K. BEEBE (*Jour. Indus. and Engin. Chem., 7 (1915), No. 12, p. 1054*).—Physical and chemical examination of the oil extracted from the ground seeds with petroleum ether gave the following data: Density at 15° C., 0.9425; refractive index at 15°, 1.4781; saponification value 187.9; iodin value 76.47; acetyl value 61.29; insoluble fatty acids 90 per cent; neutralization value 173.4; total fatty acids

(liquid) 95 per cent, iodin value 91.8; total fatty acids (solid) 5.01 per cent, iodin value 3.12, mean molecular weight 268.6. The oil apparently possesses the physiological properties of castor oil, although to a lesser degree.

The resins in hops from various geographic localities, G. A. Russell (*Jour. Indus. and Engin. Chem., 7 (1915), No. 12, pp. 1033–1035*).—In the course of a series of studies carried on in connection with drug-plant investigations a number of determinations of the resins were made on hops from various geographical sources.

A summary of the investigation shows that a single 10-gm. sample, picked at random, does not give a correct index to the amount of soft resins in a quantity of hops, and that a number of such determinations must be made. One large representative sample of approximately 1,500 gm. also gives the same results. The methods employed in the investigation gave accurate, comparable results. The yield of soft resins varied from season to season in the same and in different localities. The ash content of the hops varied in samples from different localities, but remained approximately the same in samples from the same locality from year to year.

Isoprene from β-pinene, A. W. Schorger and R. Sayre (*Jour. Indus. and Engin. Chem., 7 (1915), No. 11, pp. 924–926, fig. 1*).

Researches on organic periodids.—I, Periodids of phenacetin, methacetin, and triphenin, W. O. Emery (*Jour. Amer. Chem. Soc., 38 (1916), No. 1, pp. 140–150*).

Chemical nature of enzyms, T. Bokorny (*Allg. Brau. u. Hopfen Ztg., 55 (1915), No. 160, pp. 899, 900*).—The enzyms investigated were treated with known volumes of sulphuric acid and ammonium hydroxid for periods of time ranging from 2 to 24 hours. The free acid or alkali was then titrated and the amount used by the enzyms thus calculated.

The experiments showed that trypsin, rennin, and emulsin bound both the acid and base. Diastase was indifferent to the acid but bound 10 per cent of the ammonia. Neither the acid nor base was taken up by pepsin, which probably has a small molecular structure similar to that of peptone and therefore does not combine with acids or bases. The author points out that the amphoteric character exhibited by these enzyms is a strong argument in favor of their protein nature.

Phosphatases in malt, L. Adler (*Biochem. Ztschr., 70 (1915), No. 1–2, pp. 1–36, figs. 5*).—Two phosphatases were found in malt, one which converts an insoluble phosphate complex into a soluble one, and the other which forms inorganic phosphate. The optimum temperature for the enzyms was found to be 58° C. The efficiency of their action depends largely upon the concentration of the solution and the accumulation of the end product. An extract of 1 part malt and 20 parts water was found to give the best results. The hydrogen ion concentration is apparently of the greatest importance in the enzym cleavages. With a concentration of p_H=5.4, all the phosphoric acid in the malt is changed to soluble form, 93 per cent of which is inorganic. The enzyms are very sensitive to hydroxyl ions, but fairly resistant to treatment with hot alcohol. A method for the determination of the preexisting phosphorus in malt has been devised.

The composition of frozen oranges and lemons, H. D. Young (*Jour. Indus. and Engin. Chem., 7 (1915), No. 12, pp. 1038–1041*).—Experimental data of work done following a very severe freeze in January, 1913, in southern California indicate that the principal change caused in citrus fruits by freezing is an excessive loss of moisture, indicated by the marked lowering of the specific gravity. The percentages of sugar and acid decrease slightly but definitely.

The edible qualities of the fruit are not impaired if it has not been frozen so severely as to cause it to dry up.

The examination of a sediment found in "Alpine milk," M. Sato (*Trans. Sapporo Nat. Hist. Soc., 5 (1915), No. 3, pp. 190–192*).—On opening a can of condensed milk a small, white, amorphous sediment was found in the bottom of the can which could readily be distinguished from the usual protein which separates from such milks. The ash content of the material was found to be 46.16 per cent. The analysis of 0.26 gm. material showed the following composition: Magnesium phosphate, 0.0017 gm.; tricalcium phosphate, 0.0486 gm.; and calcium citrate, 0.2039 gm.

A simple method of converting the Duboscq colorimeter into a nephelometer, W. R. Bloor (*Jour. Biol. Chem., 22 (1915), No. 1, pp. 145–149, figs. 2*).—The method is described in detail and illustrated by charts.

Contribution to the titrimetric determination of ammonia according to Winkler's method, E. Bernard (*Landw. Vers. Stat., 86 (1915), No. 5–6, pp. 331–337*).—The method of Winkler for the titrimetric determination of ammonia (E. S. R., 31, p. 108) has been slightly modified by using a 5 per cent solution of boric acid in place of a 3 per cent solution as originally recommended. Methyl orange was used as an indicator in preference to Congo red, as the color change was found to be sharper, especially when titrating with normal hydrochloric acid. The experimental results of a series of protein determinations in feeding stuffs, comparing the modified method with the standard Kjeldahl method, are given. Very close agreement between the results of the methods is indicated. The author concludes that the modified method is superior to the Kjeldahl method in its practical application and rapidity in protein determinations.

A simple method for the determination of small amounts of potassium, H. J. Hamburger (*Biochem. Ztschr., 71 (1915), No. 6, pp. 415–463*).—The author describes in detail a procedure for the determination of small amounts of potassium, which depends on the volumetric determination by centrifugation of the crystalline precipitate of potassiumsodiumcobaltinitrite $(Co(NO_2)_3).3(KNa(NO_2)_2)+nH_2O)$.

A special form of centrifuge tube is described in which the volume of the precipitate is measured. The capillary portion of the tube is divided into 100 parts, each division representing 0.0001 gm. of potassium. The experimental error is always within one division on the scale, whether the amount of potassium in the original solution be large or small.

The presence of a large amount of sodium or of calcium, magnesium, and sulphates does not influence the results, but phosphoric acid, except in very small amounts, interferes and must be removed. This is accomplished by precipitation with a solution mixture of calcium chlorid and calcium hydroxid, or, more advantageously, with magnesium mixture. Advantages over the chloroplatinate and perchlorate methods claimed are those of rapidity and convenience, greater accuracy and the use of less material, the absence of any interfering substance except phosphoric acid, which is easily removed, and little preparation of the sample for the determination.

The advantages of washing precipitates by centrifugation rather than by filtration are noted.

County agents' calcimeter, J. S. McHargue (*Kentucky Sta. Circ. 9 (1915), pp. 62–68, fig. 1*).—This circular describes a simple and portable apparatus for the determination of calcium carbonate in limestones used for agricultural purposes.

The limestone is treated with 20 per cent hydrochloric acid and the evolved carbon dioxid allowed to displace an equal volume of water, which is measured

in a specially graduated cylinder. The cylinder is so graduated as to read percentages of calcium carbonate directly. In a series of comparison tests with a more exact quantitative method for the determination of calcium carbonate in limestone very close average agreement results was obtained. The apparatus was standardized at 25° C. and 740 mm. pressure, and a correction table for temperatures below and above 25° is given. "The apparatus possesses sufficient accuracy and simplicity to meet all the necessary requirements involved in testing a limestone proposed for agricultural use."

Methods for the determination of carbon dioxid and a new form of absorption tower adapted to the titrimetric method, E. Truog (*Jour. Indus. and Engin. Chem., 7 (1915), No. 12, pp. 1045–1049, fig. 1*).—The author discusses the sources of error and precautions necessary in the gravimetric method and absorption in alkali hydroxids for the determination of carbon dioxid. A new form of absorption tower, using barium hydroxid as the absorbing medium, is described, and illustrated by a figure. Claims for the elimination of practically all contamination of carbon dioxid from the air and a very good end point in the titration are made. The newly proposed method has given good results as used at the Wisconsin Station.

The determination of iodin in the presence of organic matter, R. B. Krauss (*Jour. Biol. Chem., 22 (1915), No. 1, pp. 151–157*).—A colorimetric method based on the formation of palladous iodid in a solution of iodids is described in detail. The method eliminates the usual sources of error, viz, the addition of iodids, idates, or halogens. The procedure is deemed especially applicable to the determination of iodin in organic matter after fusion. Experimental data submitted indicate the accuracy of the method.

The reaction of soil and measurements of hydrogen-ion concentration, L. J. Gillespie (*Jour. Wash. Acad. Sci., 6 (1916), No. 1, pp. 7–16, figs. 2*).—The author has devised procedures for the electrometric and colorimetric determination of the hydrogen-ion concentration in soil, to ascertain the intensity of soil acidity. The hydrogen-ion exponents determined in 22 soils ranged from 4.4 to 8.6, an exponent of 7 representing neutrality, a smaller one acidity, and a larger one alkalinity. In all cases there was close agreement in results between the electrometric and colorimetric methods. The apparatus and manipulation are described in detail.

The calculation of total salt content and of specific gravity in marine waters, R. H. True (*Science, n. ser., 42 (1915), No. 1090, pp. 732–735, fig. 1*).

The Kjeldahl-Gunning-Arnold method for nitrogen, J. M. Pickel (*Jour. Indus. and Engin. Chem., 7 (1915), No. 4, p. 357*).—From experimental data submitted the author regards 30 minutes' vigorous boiling, from start to finish, as sufficient for the determination of the organic nitrogen by the Kjeldahl-Gunning-Arnold method, using a 0.7-gm. sample.

A note upon the Kjeldahl method for nitrogen determination, P. L. Blumenthal and G. P. Plaisance (*Jour. Indus. and Engin. Chem., 7 (1915), No. 12, pp. 1044, 1045*).—While engaged in analyzing the carcasses of newborn pigs at the Iowa Station, some difficulty was experienced in obtaining concordant results in the nitrogen determinations. After conducting a series of analyses under varying conditions it was found that the Kjeldahl-Gunning-Arnold and the Gunning-Copper sulphate digestions cleared more quickly than those of the other methods tested. Experimental data submitted indicate that 30 minutes' total heating, as recommended by Pickel (see above), is not sufficient to fix all the nitrogen in the protein material. Heating for a definite length of time after clearing of the solution was found a more satisfactory procedure than a definite length of time of total heating. An explanation of the forma-

tion of the black deposit which tends to accumulate in the condensers and adapters of the distillation rack is suggested.

A colorimetric method for the estimation of amino-acid α-nitrogen, V. J. HARDING and R. M. MACLEAN (*Jour. Biol. Chem., 20* (*1915*), *No. 3, pp. 217–230, figs. 3*).—A method for the estimation of amino-acid α-nitrogen has been devised, as follows:

"One cc. of the solution to be estimated, containing not more than 0.05 mg. of amino-acid α-nitrogen and neutral to phenolphthalein, is mixed with 1 cc. of a 10 per cent aqueous solution of pure pyridin and 1 cc. of a freshly prepared 2 per cent solution of triketohydrindene hydrate and heated in a rapidly boiling constant-level water bath for 20 minutes. At the end of that time the test-tube is removed, cooled, and diluted to a suitable volume, usually 100 cc.; but if the amino-acid α-nitrogen is very small in amount a correspondingly smaller dilution can be used. The solution of coloring matter thus obtained is compared with the standard color in the usual way in a Duboscq colorimeter."

The method has been found to be as accurate as the Van Slyke method (E. S. R., 25, p. 710). It is inaccurate, however, for cystin. From 0.005 mg. to 0.05 mg. of amino-acid α-nitrogen per cubic centimeter can be estimated with the method. It has been found to be applicable to the determination of amino-acid α-nitrogen liberated in protein hydrolysis.

Improvements in the method for analysis of proteins by determination of the chemical groups characteristic of the different amino acids, D. D. VAN SLYKE (*Jour. Biol. Chem., 22* (*1915*), *No. 2, pp. 281–285*).—Improvements in the original method, as previously noted (E. S. R., 26, p. 22), include the use of a 2-in. Büchner funnel with a flat circle of hardened filter paper for filtering the phosphotungstic acid precipitate; the use of the washing solution at 0° C.; the decomposition of the basic phosphotungstates (removal of the phosphotungstic acid) by extraction with an ether-amyl alcohol (1:1) mixture in an acid solution; the determination of the amino nitrogen in the bases with the micro-amino apparatus; and the determination of the total nitrogen of the bases in duplicate by diluting the residue from the arginin determination to from 100 to 200 cc. and dividing into halves.

A method for the estimation of the tryptophan content of proteins, involving the use of baryta as a hydrolyzing agent, ANNIE HOMER (*Jour. Biol. Chem., 22* (*1915*), *No. 2, pp. 369–389*).—The hydrolysis of the protein by barium hydroxid, removal of the hydroxid with sulphuric acid, precipitation of the tryptophan with mercuric sulphate, decomposition of the precipitate, and the subsequent bromination of the tryptophan solution is recommended as a procedure for the determination of tryptophan.

The estimation of fat, H. ROSENTHAL and P. F. TROWBRIDGE (*Jour. Biol. Chem., 20* (*1915*), *No. 4, pp. 711–717*).—The estimation of fat by the use of solvent alone gives all substances soluble in the extraction medium used, but by simple extraction only approximately true results for fat are obtained, especially when other soluble substances are present. The authors have, therefore, proposed the following method:

"The sample is heated for two hours with 30 cc. of a 20 per cent sodium hydroxid solution. Place the beaker in the water bath and cover with a funnel having the stem cut off. During this saponification the mixture is stirred a few times.

"The solution while still warm is transferred to a glass-stoppered separatory funnel of about 300 cc. capacity. The beaker is washed out two or three times with warm water. The solution is then acidified with 35 cc. of a 20 per cent hydrochloric-acid solution (specific gravity 1.1). After thorough cooling the

contents of the separatory funnel are shaken out with ether. The combined portions of the ether solution are filtered and evaporated to dryness on the water bath. The residue is next taken up with about 25 cc. of fat-free petroleum ether (boiling point 30 to 50° C.), and about 10 or 15 cc. of 95 per cent alcohol is added. This is titrated with twentieth-normal alkali, using about 2 drops of a 1 per cent solution of phenolphthalein as indicator. The end point is sharp and distinct."

Concordant results of the fat content of blood, liver, and clear back fat of pork were obtained, which was not possible with the Soxhlet or Kumagawa-Suto[1] methods.

Experimental and critical contributions to the examination of foods (*Experimentelle und kritische Beiträge zur Neubearbeitung der Vereinbarungen zur einheitlichen Untersuchung und Beurteilung von Nahrungs- und Genussmitteln sowie Gebrauchtsgegenständen für das Deutsche Reich. Berlin: J. Springer, 1911, vol. 1, pp. VI+266, figs. 12; 1914, vol. 2, pp. VIII+306, figs. 4*).—This is a collection of reprints of investigations by various authors on food analysis and detection of adulterants, issued by the Imperial Health Service (Kaiserlichen Gesundheitsamte).

The determination of starch in raw potatoes, E. Ewers (*Ztschr. Öffentl. Chem., 21 (1915), No. 15, pp. 232, 233*).—The author describes two procedures for the preparation of the sample for analysis. Methods for determination of the starch with the polariscope, (1) by dissolving the starch in hot dilute hydrochloric acid and (2) by dissolving the starch in cold concentrated hydrochloric acid, are described in detail.

The determination of glycerin in wine, F. Wohack (*Ztschr. Landw. Versuchsw. Österr., 17 (1914), No. 8–9, pp. 684–697, fig. 1*).—The author describes a modified apparatus and procedure for the determination of glycerin in wine, based on the principle of the Klemenc method. Concordant results have been obtained and the procedure is recommended as being the least expensive thus far proposed.

Note on the determination of milk fat, A. M. Wright (*Trans. and Proc. New Zeal. Inst., 47 (1914), pp. 572, 573*).—A series of fat determinations on fresh milk, comparing the official Adams and the Gottlieb methods, were carried out. The Gottlieb method was found to give consistently higher results.

Note on the use of colloidal iron in the determination of lactose in milk, R. L. Hill (*Jour. Biol. Chem., 20 (1915), No. 3, pp. 175–177*).—The use of a 10 per cent solution of colloidal iron (dialyzed ferric hydroxid) is recommended as a protein precipitant. The method is as follows:

"To a 10-gm. sample of milk which has been diluted to about 25 cc., about 3 cc. of a 10 per cent solution of colloidal iron is added. The amount of colloidal iron necessary depends upon the composition of the milk and can be accurately determined by adding the last portion drop by drop, and agitating after each addition. If the precipitation is complete, a clear supernatant liquid separates out from the flocculent precipitate; if too little has been added, the supernatant liquid will appear milky; if too much, it will have a reddish tinge. The sample is next filtered into a 100 cc. volumetric flask, and the precipitate thoroughly washed with distilled water until the filtrate and washings aggregate about 100 cc. The flask is then filled to the mark and the percentage of lactose determined by Benedict's quantitative method [E. S. R., 25, p. 15]. About 16 cc. of the diluted sample will be required to reduce completely 25 cc. of Benedict's quantitative solution."

[1] Biochem. Ztschr., 8 (1908), No. 2–4, pp. 212–347.

Experimental data indicate that very accurate results can be obtained with the method.

Experimental data comparing the delicacy of different tests for hydrogen peroxid in milk, I. T. DARLINGTON (*Jour. Indus. and Engin. Chem., 7 (1915), No. 8, p. 676*).—Of the various reagents in general use for the detection of hydrogen peroxid, p-phenylenediamin and benzidin were found to give the most delicate tests for its presence in raw milk. Quantities as low as 0.75 mg. in 100 cc. of milk could be detected by these reagents. In the amounts ordinarily added to milk as a preservative, it could not be detected after 18 hours standing.

The apparent effect of acetic acid upon the constants of butter fat, C. BAHLMAN (*Jour. Indus. and Engin. Chem., 7 (1915), No. 8, pp. 680, 681*).—When fats are separated from dairy products in the presence of strong acetic acid, some of the acid is retained mechanically by the fat and affects the refractometer reading, saponification value, and Reichert-Meissl value. Correct values for these constants may be obtained with the acetic-sulphuric-acid method by heating the fat at from 90 to 95° C. for one hour before making the determination. Hydrochloric and sulphuric acids, when used for the separation of the fat, are not retained to any appreciable extent and give correct results.

Chemical technology and analysis of oils, fats, and waxes, J. LEWKOWITSCH (*London: Macmillan & Co., Ltd., 5. ed., rev. and enl., 1913, vol. 1, pp. XXIV+668, figs. 59; 1914, vol. 2, pp. XIV+944, figs. 19; 1915, vol. 3, pp. VIII+483, figs. 27*).—An entirely rewritten and revised edition of that previously noted (E. S. R., 21, p. 518). New analytical methods have been incorporated and an endeavor made to eliminate what has become antiquated.

The quantitative determination of creatin in muscle and other organs, N. W. JANNEY and N. R. BLATHERWICK (*Jour. Biol. Chem., 21 (1915), No. 3, pp. 567–582*).—This includes a study of the origin of creatin and creatinin, combined with an investigation of previously described procedures for the quantitative determination of creatin in muscle and organs. The authors conclude that "creatin and creatinin are probably not to be regarded as existing in firm combination in liver and muscle, as acid hydrolysis of such organs, previously freed of these substances by extraction, fails to yield additional creatin or its anhydrid."

Criticisms on previously described methods are offered and improved procedures for the determination of creatin in muscle and other organs described.

A method for the determination of chlorids in small amounts of body fluids, F. C. McLEAN and D. D. VAN SLYKE (*Jour. Biol. Chem., 21 (1915), No. 2, pp. 361–370*).—The method was devised for using quantities of material as small as 0.5 cc. and to obtain an accuracy of 1 part per 100. The determination requires two steps: (1) Removal of proteins and (2) titration of chlorids.

The proteins may be removed by coagulation or by ignition, the results being identical by both methods. Coagulation is, however, simpler in routine work. After removal of the proteins "the chlorids are precipitated in the presence of nitric acid by standard silver nitrate solution, the silver chlorid is removed by filtration, and the excess silver titrated with standard potassium iodid. The titration is performed in the presence of nitrous acid and starch, so that the first drop of iodid in excess of the silver present is changed to free iodin and gives the blue starch-iodin color. The optimum acidity for the end point is fixed by the addition of trisodium citrate in amount equivalent (one-third molar) to the free nitric acid present. Under these conditions one drop of excess fiftieth-normal iodid gives a color perceptible in 150 cc. of solution."

The method is applicable to the determination of chlorids in blood, serum, ascitic fluid, urine, pleural exudates, gastric juices, etc.

A rapid method for determining calcium in urine and feces, H. LYMAN (*Jour. Biol. Chem., 21 (1915), No. 3, pp. 551–556*).—A rapid method, consisting of three main steps, (1) isolation of the calcium as calcium oxalate, (2) solution of the calcium oxalate in dilute acid, and (3) precipitation of the calcium as a soap and comparison of the cloud so formed with a standard in a Duboscq colorimeter, is described in detail.

A simple method for the determination of ammonia in urine, A. A. BONNEMA (*Chem. Ztg., 39 (1915), No. 82–83, p. 519*).—The method devised is as follows:

To 10 cc. of the urine in a 300-cc. Erlenmeyer flask 30 cc. of absolute alcohol is added, together with several small pieces of pumice stone and 0.5 gm. of unslaked lime. The flask is fitted with an adapter to which is attached a condenser by a piece of rubber tubing. The flask is heated with constant shaking over a free flame and the distillate received in a 50 cc. graduate containing 10 cc. of tenth-normal sulphuric acid. When the liquid in the graduate measures 40 cc., the distillation is stopped. The contents of the graduate are transferred to a flask, about 75 cc. of distilled water added, and the excess acid titrated with tenth-normal alkali, using 1 per cent p-nitrophenol or other indicator suitable for ammonia titrations. Claims made for the method are (1) that ammonia does not exist as ammonium hydroxid in alcoholic solution and hence distills over completely, (2) the distillate always consists of a mixture of water and alcohol, as does the residue in the flask, and (3) urea can not take up water in alcoholic solution and thus form ammonium carbonate.

The formol titration method of Henriques and Sörensen (E. S. R., 23, p. 217) has been slightly modified for the determination of amino acids in urine.

The gravimetric determination of tannic acid in tanning materials, A. GAWALOWSKI (*Ztschr. Analyt. Chem., 54 (1915), No. 8, pp. 403–405*).—In the method described, 50 gm. of bark or 15 gm. of other material, finely ground, is treated in a half-liter flask with 250 cc. alcohol-ether mixture (1:2). The flask is tightly stoppered and the material allowed to digest at room temperature for at least one day. Ten cc. of the clear extract is evaporated to dryness, taken up with 50 cc. of cold water (whereby the resins are precipitated), and 25 cc. of the filtrate precipitated with basic copper acetate. The precipitate is filtered on a weighed filter and air dried, later dried to a constant weight in a water bath, and ignited in a stream of air or oxygen until all the copper is changed to copper oxid and then in a stream of hydrogen to reduce the oxid to metallic copper, and the copper weighed. The difference in the two weights times 100 gives the percentage of tannin present in the material.

The tannin content of Pacific coast conifers, H. K. BENSON and T. G. THOMPSON (*Jour. Indus. and Engin. Chem., 7 (1915), No. 11, pp. 915, 916, fig. 1*).—The experimental data reported show a tannin content of Douglas-fir sawmill bark of 6.34 per cent, while the cambium layer contained 9.92 per cent. Sawmill bark of Western spruce contained 5.88 per cent of tannin. Fir waste is regarded as a suitable material for use in the tannin-extract industry.

The application of the Davis spot test in the preliminary examination of creosotes, H. CLOUKEY (*Jour. Indus. and Engin. Chem., 7 (1915), No. 11, pp. 923, 924, figs. 2*).

Practical white sugar manufacture, H. C. PRINSEN GEERLIGS (*London: Norman Rodger, 1915, pp. XII+184, pls. 5, figs. 28*).—This volume gives a complete and detailed practical account of the manufacture of white sugar, including the mechanical details of the process. The subject matter is divided into three main parts, (1) clarification of the cane juice, (2) boiling, curing,

and finishing white sugar, and (3) materials used in the manufacture of plantation white sugar. The analytical methods described in Part 3 are those employed at the Java Sugar Experiment Station. See also a previous work (E. S. R., 22, p. 312).

Utilization of American flax straw in the paper and fiber-board industry, J. L. MERRILL (*U. S. Dept. Agr. Bul. 322 (1916), pp. 24, figs. 8*).—From a series of laboratory experiments and mill tests, extending over a period of several years, it was found that by using a proper bleach a fairly good fiber board could be made from flax straw. Some of the material thus produced was sold to the trade without any complaint from the consumer. Flax tow, which contains much less woody material, was found to be more satisfactory than the straw and to produce a better quality of fiber board of medium thickness. The thin boards, however, were found to be somewhat soft, while the thick ones were somewhat brittle. It is indicated that the straw requires some previous treatment to remove at least a portion of the woody matter.

The milk of lime process was used throughout, it being deemed the most suitable under the experimental conditions.

Yield of by-products from destructive distillation of some western conifers, H. K. BENSON and M. DARRIN (*Jour. Indus. and Engin. Chem., 7 (1915), No. 11, pp. 916–918*).

Discoloration of maple in the kiln, R. C. JUDD (*Jour. Indus. and Engin. Chem., 7 (1915), No. 11, p. 920*).

METEOROLOGY.

The dollar and cents value of California meteorology, F. A. CARPENTER (*Univ. Cal. Chron., 17 (1915), No. 1, pp. 78–90*).—This article discusses briefly some practical applications of meterology in California, particularly the utilization of warnings of frost in the citrus region, hot waves and floods in southern California, and storms on the California coast. The causes of these phenomena and means of protection against frost are briefly discussed. Brief mention is made of an intensive climatological survey which was begun in 1914 on a tract of land in southern California 5 miles wide and 15 miles long, extending from the sea to an elevation of 1,500 ft., with a view to securing the best possible utilization of the land for town sites, country homes, and intensive agriculture.

The physician and the Weather Bureau, F. A. CARPENTER (*Jour. Amer. Med. Assoc., 66 (1916), No. 1, pp. 6–11, figs. 4*).

The influence of the moon on weather changes and atmospheric disturbances, R. FISCHER (*Wetter, 32 (1915), No. 7, pp. 161–165*).—An attempt is made in this article to correlate weather changes with the phases and position of the moon during 1914. It is indicated that a certain correlation was shown.

Battles and rainfall, A. MCADIE (*Sci. Mo., 2 (1916), No. 2, pp. 170–173*).—The evidence showing that there is no relation between battles (more especially gunfire) and rainfall is briefly presented, and reference is made to inquiries as to the cause of abnormal rainfalls.

Instructions to river and rainfall observers, A. J. HENRY (*U. S. Dept. Agr., Weather Bur., Instructions to Special River and Rainfall Observers, 1915, pp. 27, pl. 1, figs. 6*).—These, the latest administrative instructions on this subject, were issued October 23, 1915.

Instructions for the installation and operation of class "A" evaporation stations, B. C. KADEL (*U. S. Dept. Agr., Weather Bur., Instrument Div. Circ. L (1915), pp. 26, pls. 4, figs. 4*).—These, the latest instructions on this subject, were issued October 16, 1915.

On the measurement of dew, F. Eredia (*Agr. Colon.* [*Italy*], *9* (*1915*), *No. 12, pp. 705–714, pls. 2, figs. 2*).—Improved methods and apparatus for measuring dew are described.

The specific density of snow, F. Wengler (*Die spezifische Dichte des Schnees. Inaug. Diss., Friedrich-Wilhelms Univ., 1914, pp. 86; abs. in Wasser u. Abwasser, 9* (*1915*), *No. 15, p. 520*).—This is an inaugural dissertation dealing with the methods and results of the determination of the density of snow as affected by varying conditions of temperature, wind, depth, age, etc. The literature of the subject is fully reviewed with numerous references.

Swedish meteorological observations, 1912 and 1913 (*Met. Iakttag. Sverige* (*Observ. Mét. Suéd.*), *K. Svenska Vetensk. Akad., 54* (*1912*), *Bihang, pp. 71, pls. 30; 55* (*1913*), *pp. 157*).—These are the usual meteorological summaries of observations made under the direction of the Central Meteorological Institute of Sweden.

Rainfall observations, compiled by K. Diem (*Bul. Deli Proefstat. Medan, No. 6* (*1915*), *pp. V+640*).—This is a compilation of rainfall observations since 1875 at various places, especially on the east coast of Sumatra.

The relation of rainfall to the water supply for human consumption, industry, and agriculture, Grohmann (*Steht die Niederschlagsmenge noch im Einklange mit dem Wasserverbrauch der Bevölkerung, Industrie, und Landwirtschaft? Leipsic: Schr. Oekonom. Gesell. Königreich Sachsen* [*1914*], *pp. 15, fig. 1*).—The water supply is discussed in its relation to rainfall, evaporation, drainage, and run-off, assuming that each of the three latter accounts for one-third of the rainfall. The discussion is based in large part on rainfall and ground water measurements at Leipsic, Dresden, and Freiburg, the data for Dresden covering the period from 1867 to 1906.

Observations on lightning strokes, Joseph (*Allg. Forst u. Jagd Ztg., 91* (*1915*), *July, pp. 165–170*).—Data regarding lightning strokes in Hesse during 1914, with special reference to the relative amount of damage done to different kinds of trees, are presented and discussed in this article.

SOILS—FERTILIZERS.

Soil survey of Tattnall County, Georgia, A. E. Taylor, T. D. Rice, C. Van Duyne, and E. H. Stevens (*U. S. Dept. Agr., Advance Sheets Field Operations Bur. Soils, 1914, pp. 48, fig. 1, map 1*).—This survey, made in cooperation with the Georgia State College of Agriculture and issued December 27, 1915, deals with the soils of an area of 382,080 acres in southeastern Georgia, the surface of which varies from flat to rolling. "The greater part of the county is well drained, but there are extensive poorly drained stretches in the upland as well as on the terraces and in the stream bottoms."

The soils of the county are of sedimentary and alluvial origin. Including swamp and peat, 27 soil types of 12 series are mapped, of which the Tifton sandy loam and fine sandy loam are considered the strongest and most productive types. The Tifton sandy loam is the most extensive single type, with the Norfolk sandy loam and sand second and third in extent.

Soil survey of Clinton County, Indiana, W. E. Tharp, R. H. Peacock, and C. M. Rose (*U. S. Dept. Agr., Advance Sheets Field Operations Bur. Soils, 1914, pp. 28, fig. 1, map 1*).—This survey, made in cooperation with the Indiana Department of Geology and issued December 30, 1915, deals with the soils on an area of 254,720 acres in north-central Indiana, the surface of which varies from gently undulating to moderately rolling. "The soils are derived from a comparatively shallow surface layer of silty material, usually less than 3 ft. deep, overlying bowlder clay of great depth." Including three miscellaneous

types, 10 soil types of 5 series are mapped, of which the Miami silt loam covers 63.7 per cent and the Clyde silty clay loam 22.3 per cent of the area.

Soil survey of Clarke County, Mississippi, A. L. GOODMAN and E. M. JONES (*U. S. Dept. Agr., Advance Sheets Field Operations Bur. Soils, 1914, pp. 41, fig. 1, map 1*).—This survey, made in cooperation with the Mississippi Geological Survey and issued December 31, 1915, deals with the soils of an area of 437,760 acres in eastern Mississippi, lying wholly within the Coastal Plain province. "It embraces three topographic divisions: (1) The uplands, built up of alternating beds of sands and clays, (2) second bottoms, or alluvial terraces, and (3) the broad alluvial first bottoms of streams, subject to frequent overflow. . . . The topography of the uplands ranges from flat through undulating or rolling to hilly and ridgy. The stream bottoms and second bottoms are prevailingly flat. While much of the flat terrace land is naturally well drained, there are considerable areas that would be materially benefited by artificial drainage."

The soils are of sedimentary origin and range in texture from sands to clays. Including meadow, 30 soil types of 18 series are mapped, of which the Ruston fine sandy loam is the most extensive type, with the Orangeburg, Kalmia, and Susquehanna fine sandy loams next in order.

Soil survey of Grundy County, Missouri, A. T. SWEET and W. I. WATKINS (*U. S. Dept. Agr., Advance Sheets Field Operations Bur. Soils, 1914, pp. 34, pls. 2, fig. 1, map 1*).—This survey, made in cooperation with the Missouri Experiment Station and issued January 17, 1916, deals with the soils of an area of 281,600 acres in north-central Missouri.

"The topography of the greater part of the county is rolling to very rolling, and consists of long ridges of upland separated by long, broad, and nearly parallel valleys. The surface of much of the southwestern part is more broken, but also includes undulating areas of importance." All the upland is said to be well drained.

The soils of the county are of residual, glacial, and alluvial origin. Eleven soil types of eight series are mapped, of which the Shelby loam covers 41.7 per cent, the Wabash silt loam 17.5 per cent, and the Grundy silt loam 17.1 per cent of the area.

Soil survey of Scotts Bluff County, Nebraska, L. T. SKINNER and M. W. BECK (*U. S. Dept. Agr., Advance Sheets Field Operations Bur. Soils, 1913, pp. 43, fig. 1, map 1*).—This survey, made in cooperation with the Nebraska Soil Survey and issued December 31, 1915, deals with the soils of an area of 462,720 acres in western Nebraska.

"Scotts Bluff County . . . is in the High Plains region, but most of its area lies within the valley of the North Platte River. . . . The topographic features of the county consist of (1) the remnants of the High Plains, (2) the escarpments, (3) the grade plains on the south side and across the northeast corner, (4) the ancient terrace on the north side now eroded into a rolling topography, and (5) the modern undissected terraces and existing river flood plain." On the basis of origin the soils of Scotts Bluff County are (1) residual, (2) alluvial, (3) eolian, (4) colluvial and alluvial-fan soils, and (5) miscellaneous types.

The rather constant winds of this region have considerably modified the surface of practically all the soils of the county. Exclusive of dunesand, meadow, marsh, rough broken land, and Bad Lands, 19 soil types of 9 series are mapped, of which the Mitchell very fine sandy loam, the Tripp very fine sandy loam, the Epping silt loam, and the Mitchell silt loam are, in their order, the largest in extent.

Petrography of some North Carolina soils and its relation to their fertilizer requirements, J. K. Plummer (*U. S. Dept. Agr., Jour. Agr. Research, 5 (1915), No. 13, pp. 569-581, pl. 1*).—Mineralogical analyses made at the North Carolina Experiment Station of five samples of each of the soil series encountered in the soil survey of the State of North Carolina are reported and discussed. The methods of analyses used were essentially those compiled by McCaughey and Fry (E. S. R., 28, p. 812).

Wide variations in mineralogical composition were found between the soils of the Appalachian Mountain, Piedmont Plateau, and Atlantic Coastal Plain provinces of the State. "There is unquestionably a greater supply of minerals which carry the inorganic plant-food constituents in the mountain soils than are found in either the Piedmont Plateau or the Coastal Plain. Though many of the former soils are derived from the same rocks as those of the Piedmont province, the forces of erosion among those of the mountains cause them to contain minerals more nearly the same as the parent rocks than are found elsewhere."

It is concluded that definite information is required on the behavior of the various soil-forming minerals to the forces of weathering before positive conclusions can be drawn on the availability of the plant food carried by the different minerals. The average results of seven years' fertilizer tests with cotton on a typical Cecil clay loam soil, similar to those previously noted (E. S. R., 31, p. 621), are also reported, which "indicate that there are some relationships existing between the mineral component of the soil and the requirements of this plant for the three inorganic fertilizer constituents, phosphoric acid, potash, and lime."

Geology, hydrology, and mineralogy of the Province of San Luis, E. Gerth (*An. Min. Agr. Argentina, Secc. Geol., Mineral. y Mineria, 10 (1914), No. 2, pp. 64, pls. 2, figs. 6*).—This report deals with the geology, hydrology, and mineralogy of the Province of San Luis in Argentina, and contains a bibliography. The hydrological section deals with the soils and vegetation, with particular reference to climatic factors affecting the water supply and to certain soils containing considerable amounts of alkali. Analyses of irrigation waters and alkali soils are included.

Report on soils of Sierra Leone, D. W. Scotland (*Ann. Rpt. Agr. Dept. Sierra Leone, 1914, pp. 14-25*).—This report deals with the general characteristics of the soils of the different districts of Sierra Leone and reports mechanical and chemical analyses of seven samples of representative well-drained types.

It is stated that the soils of Sierra Leone are of igneous origin and are about 80 per cent laterite. The other types occurring are sands, sandy loams, and isolated pockets of clay. The results of the analyses are taken to indicate that the soils are generally deficient in lime, total and available phosphoric acid, and reserve potash, but contain adequate supplies of nitrogen, humus, and available potash.

Studies on the agricultural value of the silts transported by the streams of the Alps and Pyrenees Mountains, A. Müntz and E. Lainé (*Compt. Rend. Acad. Sci. [Paris], 160 (1915), No. 16, pp. 491-495*).—In further studies of these silts (E. S. R., 33, pp. 718, 719) it was found that they are capable of influencing both the chemical and mechanical character of soils.

With reference to the content of fertilizing constituents they are considered equal to soils of average fertility, analyses showing nitrogen 0.7 to 1.2 per cent, phosphoric acid 0.8 to 1.5 per cent, and potash 1.5 to 2 per cent. When the clay content was high the potash content was found to vary from 3 to 4 per cent. The silts are also rich in calcium carbonate.

Physical analyses of the soils showed a great variation in permeability. The coarser silts showed the greatest permeability, but the silts held in suspension in irrigation canals were almost impermeable. The air capacity decreased and the moisture capacity increased with the density of the silt.

Owing to the large amounts of silt carried in suspension by some of the irrigation canals supplied by these streams, it is concluded that long-continued irrigation with such water is capable of modifying quite considerably the physical condition of soil by greatly increasing its content of fine particles and its water capacity and causing it to become compact, impervious, and poorly aerated.

Soil productivity and agro-geological surveys, H. T. Ferrar (*Jour. Canterbury Agr. and Past. Assoc., 3. ser., 3* (*1915*), *pp. 28–35*).—This article briefly outlines the development and economic value of soil surveys in this country, Egypt, Australia, and New Zealand.

On the probable error of sampling in soil surveys, G. W. Robinson and W. E. Lloyd (*Jour. Agr. Sci.* [*England*], *7* (*1915*), *No. 2, pp. 144–153, figs. 2*).—Laboratory experiments with 25 samples from a field of glacial drift soil and 15 samples from a field of sedimentary soil are reported. The purpose was to obtain values for the probable field error due to the normal variation in the composition of the soil from point to point in a field.

It was found "that an accuracy of 5 per cent in mechanical analysis is insured a probability of 4:1 by doing a duplicate analysis on six borings. For survey purposes this is probably sufficient, since it is not conceivable that variation in the amount of any fraction corresponding to 5 per cent (relative to the amount of the fraction) could have any effect on the properties of a soil. In the case of chemical analysis it does not seem that the same accuracy can be expected. . . . In the case of a critical study of one soil, however, it would be necessary to reduce the errors much more by repeating analyses and increasing the number of borings."

A soil sampler for soil bacteriologists, H. A. Noyes (*Science, n. ser., 42* (*1915*), *No. 1079, p. 317*).—A sampler is described which, it is stated, will sample the soil under one system of cultivation as well as another and which becomes the soil container. It consists essentially of a brass tube 11 in. long with a cutting edge at one end furnished with a tight-fitting 2-in. brass cap. The open end is plugged with absorbent cotton. In using the sampler it is first plugged and capped and sterilized by hot air. The cap is then removed in the field and the sample taken by driving the sampler into the ground to the desired depth, removing, flaming, and recapping.

New methods in soil protozoology, N. Kopeloff, H. C. Lint, and D. A. Coleman (*Science, n. ser., 42* (*1915*), *No. 1078, pp. 284–286*).—The substance of this article has been previously noted from another source (E. S. R., 33, p. 809).

Investigations on the distribution of Cyanophyceæ on and in different soils, F. Esmarch (*Hedwigia, 55* (*1914*), *No. 4–5, pp. 224–273, figs. 5*).—Investigations on the occurrence and distribution of Cyanophyceæ in from 35 to 45 samples of the surface soil of each of several different German soils when cultivated and uncultivated and in 129 samples of the subsoils of the same are reported.

The percentage of samples of each surface soil containing Cyanophyceæ were as follows: Cultivated marsh soil, 95 per cent; cultivated loam soil, 94.6 per cent; uncultivated moist sand soil, 88.6 per cent; cultivated sand soil, 64.4 per cent; forest soil, 12.5 per cent; sandy heather soil, 9 per cent; and moor soil, none. These results are taken to indicate that the occurrence and distribution of Cyanophyceæ in the surface soil depend largely on the content of moisture and of nutritive salts in the soil.

Cyanophyceæ were found in 40 out of 45 samples of subsoils of cultivated sand, loam, and marsh soils. In all these cases Cyanophyceæ had been found in the surface soil and the species in surface and subsoil corresponded perfectly. This is attributed largely to cultivation. The algæ were also found in 23 out of 32 subsoil samples of the same soils when uncultivated, although in several of these cases no algæ were found in the surface soil. It is concluded, however, that the occurrence of Cyanophyceæ in subsoils of uncultivated soils is due largely to displacement from the surface soil by natural agencies. Cyanophyceæ were found to be widely distributed in the deeper layers of moist sand soils from three different localities, while the subsoils of forest, heather, and moor soils contained practically none.

Further experiments with sterilized and unsterilized subsoils inoculated with artificial cultures of Cyanophyceæ led to the belief that at least certain kinds of Cyanophyceæ can exist for a long time in the soil, depending largely on its content of nutritive constituents, but that Cyanophyceæ can only indirectly take a part in nitrogen fixation. The importance of further investigation along this line is discussed.

A classified list of the species of Cyanophyceæ found is included.

The effect of climate on soil formation, J. W. LEATHER (*Jour. Agr. Sci. [England], 7 (1915), No. 2, pp. 135, 136*).—With reference to a previous article by Russell (E. S. R., 31, p. 214) it is stated that the formation of the mineral framework of the lateritic and "black cotton" soils of India can not be attributed simply to either weather or climate.

Observations on heating of the surface soil in 1914, MÜNCH (*Naturw. Ztschr. Forst u. Landw., 13 (1915), No. 6–7, pp. 249–260*).—The results of observations made in April, May, June, and July on the temperature of loose sandy and sandy humus soils are reported, together with the corresponding meterological data, the purpose being to determine the influence of meteorological conditions, the color and density of the soil, and the soil covering on soil temperature.

It was found that the higher soil temperatures very frequently occurred on rather cool days. The soil temperature was also higher the drier, looser, and darker the soil. The damp soil never reached a temperature injurious to vegetation. The deeper layers of loose soil subjected to direct sunlight were, however, cooler than the deeper layers of dense soil. Rolling and packing of loose soils with lower temperatures in the deeper layers and excessive surface evaporation was profitable. Next to that of raw humus, the highest temperature was observed in soil covered with pine needles. Heat radiation from the soil was found to be governed largely by the nature of the soil covering and the existence of side protections, such as trees and bushes.

Soil gases, J. W. LEATHER (*Jour. Agr. Sci. [England], 7 (1915), No. 2, pp. 240, 241*).—The author interprets the results of previous experiments by Russell and Appleyard (E. S. R., 33, p. 618) and of similar experiments by himself on Pusa soil as indicating that the gases, extracted from soils which had been botttled, the air extracted, and the soil allowed to stand for one or more days, were of comparatively large volume and were "formed and liberated gradually, presumably by bacterial action."

Soil gases, A. APPLEYARD and E. J. RUSSELL (*Jour. Agr. Sci. [England], 7 (1915), No. 2, p. 242*).—This is a reply to the above.

Soil ventilation, A. and G. L. C. HOWARD (*Agr. Research Inst. Pusa [India] Bul. 52 (1915), pp. 35, fig. 1; abs. in Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases, 6 (1915), No. 7, pp. 918, 919*).—This paper reports experiments on aeration of the alluvial soils of the Indo-Gangetic plain and the results of long continued observations on the influence of soil ventilation on

crop growth. Several examples of damage to crops attributed to lack of air in the soil are described.

The results of this study are taken to indicate that one of the conditions for the best growth of crops in the alluvial soil is an ample supply of air for the roots, obtained by adjusting and maintaining the proper relations between the air and water in the soil. Water, when excluding air from the roots, was found to act as if it were a poison to crops.

Soil colloids, P. EHRENBERG (*Die Bodenkolloide. Dresden and Leipsic: Theodor Steinkopff, 1915, pp. XII+563, figs. 8*).—It is the purpose of this book, which is intended for agricultural chemists, scientifically inclined farmers and teachers, and students of agriculture, to summarize in usable form the present knowledge and practical applications of the colloid chemistry of soils which, while a relatively new branch, has been constantly growing in importance.

The book is divided into three main sections. The first section briefly sketches the history and scope of colloid chemistry and points out some of the characteristic properties of colloids in general. The second section describes the different types of soil colloids and their properties, more especially from the technical viewpoint. The third section, to which by far the most space is devoted, is a practical presentation of the behavior of the different soil colloids under the influence of the different natural and cultural agencies.

The adsorptive power of peat moors, P. ROHLAND (*Kolloid Ztschr., 16 (1915), No. 5–6, pp. 146–148*).—Experiments are reported in which it was found that the adsorptive power of peat moor soil is similar to, but considerably less than, that of clays and clay soils. The peat soil also contained colloids capable of adsorbing analin, vegetable, and animal dyes of complex composition, but did not adsorb dyes of simple composition. Adsorption of ions was not observed with peat soil.

The formation of humic bodies from organic substances, W. B. BOTTOMLEY (*Biochem. Jour., 9 (1915), No. 2, pp. 260–268*).—An investigation of the relationship between carbohydrates and the so-called "humic acid" and "humin" substances from soil is reported. For the purpose of this investigation humic acid was assumed to consist of "substances thrown down as brown colloidal precipitates by mineral acids from the water or alkaline extracts of humus," and humin of "substances insoluble in water and alkalis, but rendered soluble by fusing with caustic soda or potash, from the solution of which humic acid can again be precipitated."

It was found that sugars on boiling with hydrochloric acid yielded a mixture of humic acid and humin bodies, varying in proportion with the different sugars used. The composition of "natural" humic acid from soil or peat, after purification by alcohol, was found to approximate very closely that of "artificial" (sugar) humic acid. Humic acid and humin were also produced from sugars by the action of various organic acids, lactic, acetic, propionic, butyric, etc. The action of heat alone on sugars produced humic acid and humin bodies, these substances being stages in the process of carbonization. Humic bodies were not obtainable from proteins free from carbohydrates. "The two groups of humic bodies, humic acid and humin, obtained artificially from carbohydrates, indicate a basis for the natural processes of humus formation."

A list of references to literature bearing on the subject is appended.

Amino-acid nitrogen of soil and the chemical groups of amino acids in the hydrolyzed soil and their humic acids, R. S. POTTER and R. S. SNYDER (*Jour. Amer. Chem. Soc., 37 (1915), No. 9, pp. 2219–2227*).—Studies, at the Iowa Experiment Station, of soils receiving six different treatments and of peat soil are reported, the purpose of which was to correlate "the amounts of the various chemical groups [E. S. R., 26, p. 22] (1) in the soil with its humic acid, (2) in

the soil and its humic acid with the kind of organic fertilizer previously applied to the soil, (3) in the soil and its humic acid with similar groups found in pure proteins, and (4) to compare the amounts of amino-acid nitrogen, as such, in the soil with that found by hydrolysis."

It was found that the amount of nitrogen precipitated from a neutralized alkali extract of soil varied in a qualitative way inversely with the strength of the acid. The amount of humin nitrogen extracted by dilute alkali from soil was very high when compared with the amounts in proteins. Dilute alkali did not extract any typical class of organic compounds from the soil. The amount of amino acid and peptid nitrogen in soil was found to be very small when compared to the amounts of amino acids formed by hydrolysis.

Transformation of vegetable compounds into humus, A. Trusov (*Selsk. Khoz. i Lîesov., 248 (1915), July, pp. 409–437*).—Experiments are reported in which it was found that the humification of various organic compounds consists of both chemical and biological processes, woody substances being humified by chemical compounds and fungi, albumin by biological processes alone, and substances containing tannin and chlorophyll by chemical processes alone. The process of humification was aided by good aeration and relatively high temperatures. The time necessary for complete humification of the various compounds varied, albumin requiring a longer period than lignin substances containing tannic acid and chlorophyll. Starch was humified very slowly. Water extracts of undecomposed woody substances were very active in humus formation. Humus was not formed from proteids from substances containing tannic acid and chlorophyll, and was formed from lignin only when that substance decomposed together with albumin.

The effect of removing the soluble humus from a soil on its productiveness, W. Weir (*Jour. Agr. Sci. [England], 7 (1915), No. 2, pp. 246–253*).—Experiments under laboratory conditions with a medium garden soil and a typical loam soil to determine the influence of extracting the soluble humus with fifth-normal hydrochloric acid and 2 per cent sodium hydroxid on the crop of wheat, mustard, and rye, and on the nitrate and ammonia content of the soil are reported.

It was found that approximately equal total yields both of dry matter and nitrogen were obtained over four successive crops from both untreated and extracted soils. "It appears that the removal of the soluble humus had no effect in diminishing the productiveness of the soil, in spite of the fact that the soil used was known to respond to nitrogenous fertilizers. . . . The removal of the soluble humus increased the amount of ammonia but diminished that of nitrates in the soil, and the sum of ammonia and nitrate was usually less than in the untreated soil. The numbers of bacteria, however, were considerably increased. No marked difference was produced where 0.5 per cent untreated soil was added to replace the bacterial flora that might have been destroyed by the acid and alkali treatment."

The loss of nitrogen and organic matter in cultivated Kansas soils and the effect of this loss on the crop-producing power of the soil, C. O. Swanson (*Trans. Kans. Acad. Sci., 27 (1914), pp. 87–96*).—The substance of this article has been noted from another source (E. S. R., 33, p. 809).

The soil: The principles of maintaining soil fertility, M. F. Miller (*Bien. Rpt. Kans. Bd. Agr., 19 (1913–14), pp. 458–483, figs. 6*).—The substance of this article has been noted from another source (E. S. R., 23, p. 318).

How every plantation manager ought to analyze his soils, Leplae (*Trop. Life, 11 (1915), No. 10, pp. 185–188, figs. 3*).—The use of so-called pot culture analyses to determine the nutritive element relatively in minimum in the soil,

followed by field trials, is suggested as the best method for determining the fertilizer requirements of a soil.

A short survey of present views on the relation of fertilizers to soil fertility, F. B. GUTHRIE (*Rpt. Austral. Assoc. Adv. Sci., 14 (1913), pp. 642–661*).—In a brief review of recent experimental work conducted in this country and abroad regarding the relation of fertilizers to soil fertility, it is pointed out "that the action of fertilizers is not confined to supplying the crop with food . . . and that fertilizers influence the physical structure of the soil and also its biological and chemical conditions in a great variety of ways; further, that we have to take into account a large number of factors which influence the fertility of the soil, and which are quite independent of its supply of plant food. . . . Fertilizers may exert an influence on the toxic matters produced in the soil, . . . and quite remarkable effects are produced by substances added in quantities much too minute to act as nourishment to the plant."

Influence of different fertilizers on the growth of important crops, A. MAUSBERG (*Illus. Landw. Ztg., 35 (1915), Nos. 13, pp. 75, 76; 14, pp. 81, 82*).—The substance of this article was contained in a previous report (E. S. R., 30, p. 219).

Tests relative to mixing fertilizers with seed, 1912–1913, L. BRÉTIGNIÈRE and J. CARTIER (*Ann. École Nat. Agr. Grignon, 4 (1913), pp. 1–13, figs. 2*).—Tests, on a deep siliceous clay soil, a shallow limestone soil, and a limy clay soil rich in organic matter, to determine the effect on the yield of barley, clover, and vetch of mixing phosphatic fertilizers with the seed and sowing the mixture from a seeder showed that such mixing resulted in a decided increase in grain and straw in the case of vetch and clover, and a slight decrease in the case of barley.

Further tests with oats and beets, using 12 different nitrogenous, phosphatic, and potassic fertilizers, showed that the nitrates of sodium and calcium, ammonium sulphate, dried blood, superphosphate, slag, potassium chlorid, magnesium sulphate, and a so-called radio-active fertilizer can be safely mixed with oats seed. Mixing the oats seed with potassium sulphate decreased the yield of grain and mixing with cyanamid was decidedly injurious to the plant. The growth of beets was very unfavorably influenced by mixing the seed with cyanamid and to a less extent by mixing with potassium chlorid, manganese sulphate, and the radio-active fertilizer. Only a slight increase in yield was obtained by mixing the beet seed with the other fertilizers.

The composition, storage, and application of farmyard manure (*Jour. Bd. Agr. [London], 22 (1915), No. 2, pp. 131–135*).—This work has been more fully reported in bulletin form (E. S. R., 32, p. 818).

Experiments with liquid manure, J. VOGEL (*Mitt. Deut. Landw. Gesell., 30 (1915), No. 34, pp. 498–502*).—Laboratory experiments with cow urine are reported, the purpose of which was to determine (1) the influence of aeration on the nitrogen content of liquid manure, (2) the transformations undergone by liquid-manure nitrogen after absorption by peat litter, and (3) whether or not the nitrogen of peat-litter liquid-manure mixture reaches the soil in available form.

It was found that no fixed relation existed between the nitrogen content of fresh urine and its specific weight. Urine stored for four weeks in air showed evidences of ammonia formation, but only slight nitrogen losses. Slight aeration of the urine produced only a very gradual ammoniacal fermentation. When air was excluded from the urine by an oil covering there were no appreciable nitrogen losses, while without the oil covering and with long exposure the nitrogen losses were marked. Ammonia formation continued

under the oil covering for three months, most of the nitrogen being changed to the ammonia form. These results are taken to indicate that to obtain the best results with liquid manure it should be well mixed with the soil.

It was further found that nitrogen losses were large from thin layers of urine and small from thick layers. In both cases the addition of solid manure particles and peat litter increased the nitrogen losses. Nitrogen losses were greater from peat-litter urine mixtures in loose condition than when compact. In all such cases some of the nitrogen of the urine was transformed into insoluble form, especially in the loose mixture. These results are taken to indicate that urine nitrogen fixation in insoluble form can occur to an undesirable extent in peat litter. It is suggested, therefore, that where peat litter is used for the absorption of urine the resulting mixture be kept dry and practically unaerated.

Experiment on the action of different air-nitrogen fertilizers, L. Hiltner and F. Lang (*Prakt. Bl. Pflanzenbau u. Schutz, n. ser., 12 (1914), No. 11, pp. 121–128*).—Field fertilizer experiments with barley and potatoes on a stony soil to determine the relative values of lime nitrogen, calcium nitrate, sodium nitrate, ammonium sulphate, ammonium nitrate, urea, and urea nitrate as sources of nitrogen, when applied in amounts equivalent to 0.4 and 0.6 kg. of nitrogen per 100 square meters (about 35.6 and 53.4 lbs. per acre) before seeding and as a top-dressing, are reported.

Almost all the fertilizers had the most favorable influence on barley when applied as a top-dressing, especially lime nitrogen, which had the least favorable influence when applied before seeding. When the fertilizers were applied before seeding, plowing in generally proved to be better than harrowing in. The best results were obtained with potatoes when ammonium sulphate and sodium nitrate were applied and harrowed in before seeding, but with the exception of lime nitrogen the remaining fertilizers gave the best results when used as a top-dressing. It is concluded that the use of lime nitrogen as a top-dressing may be safely recommended for grains but not for potatoes, as it gave the best results with potatoes where harrowed in before planting.

Experiments with different phosphatic fertilizers on the experimental field of the Norwegian Moor Improvement Association of Märe, J. Lende-Njaa (*Meddel. Norske Myrselsk., 11 (1913), No. 4, pp. 110–114, figs. 2; abs. in Zentbl. Agr. Chem., 44 (1915), No. 2–3, pp. 96–98*).—Field fertilizer experiments on a humus moor soil with oats and peas are reported, the purpose of which was to compare the fertilizing value of Thomas slag, superphosphate, Norwegian nitrate phosphate (containing 4.18 per cent of nitrogen and 26.87 per cent of total phosphoric acid, of which 78 per cent was citrate-soluble and 3 per cent water-soluble), Norwegian ammonium phosphate (containing 11.69 per cent of nitrogen and 59.9 per cent of water-soluble phosphoric acid), and a Belgian phosphate, of which the phosphoric acid was largely insoluble. The phosphates were added in amounts corresponding to 100 kg. per hectare (89 lbs. per acre).

It was found that the crops responded as well to the nitrogen additions as to the phosphoric acid applications in spite of the relatively high nitrogen content of the soil. The water-soluble phosphates gave the best results, followed by the Thomas phosphate and the nitrate phosphate. The Belgian phosphate, while applied in excessive amounts, had practically no effect. The peas responded most to additions of water-soluble phosphoric acid.

The influence of phosphatic fertilizers on root development, R. D. Watt (*Rpt. Austral. Assoc. Adv. Sci., 14 (1913), pp. 661–665, fig. 1*).—Observations made at a number of Australian experimental farms on the influence of readily available phosphatic fertilizers on the growth of wheat plants, especially

in the early stages, led to the conclusion "that one of the beneficial effects of superphosphate on wheat (and probably other agricultural plants) under semiarid conditions is that it causes the young plant to send its roots quickly into the subsoil, thereby increasing not only its moisture absorbing capacity, but also increasing very greatly the volume of soil from which it can draw its moisture supply."

Experiments with steamed bone meal, J. GYÁRFÁS (*Kisérlet. Közlem., 18 (1915), No. 4, pp. 699–717*).—This gives results of experiments conducted at the agricultural experiment station at Magyar Ovar, Hungary, from 1910 to 1913, comparing superphosphate with Thomas slag meal and steamed bone meal. Taking the results with superphosphate as 100, the results with the other two (which gave similar results) were as follows: With winter wheat, straw 94, grain 70.5; with winter rye, straw 58, grain 62; with potatoes, 75; and with stock beets, 88.

Rock phosphate in New Zealand: Its value to the Dominion, B. C. ASTON (*New Zeal. Dept. Agr., Indus., and Com. Bul. 54, n. ser. (1915), pp. 24, figs. 9*).—This pamphlet discusses in a general way the occurrence, distribution, and value of phosphates in New Zealand.

Potash, T. E. KEITT and C. J. KING (*South Carolina Sta. Bul. 182 (1915), pp. 3–16*).—This bulletin deals with the importance of the proper conservation and use of natural and domestic sources of potash in view of the situation caused by the European war. Attention is called to the value for this purpose of tobacco stems and stalks, animal manures, wood ashes, crop residues and other plant materials, and mucks, and chemical analyses of these materials made at the station and obtained from various other sources are reported. The liberation of soil potash by the proper use of sodium nitrate, organic matter, and lime is also discussed.

With reference to soil and crop requirements for potash, work at the different substations in the State is reviewed, which shows "that the soils of the Coastal Plain section of the State require more potash than those of the Piedmont region; also, that better results are obtained where the application is made to cotton. . . . There is only a small profit from applying potash to grain crops at the prices that formerly prevailed, and of the ordinary field crops cotton is the one that will return the greatest value in increased production. . . . At the Pee Dee Station the corn yield was actually less where potash was applied. . . . The Clemson experiments show identically the same yield for three years without potash as with potash. Where twice the normal quantity of potash was used the yield was lower than where no potash was used."

Fertilizer experiments with common salt and potash salts, P. BOLIN (*Meddel. Centralanst. Försöksv. Jordbruksområdet, No. 94 (1914), pp. 15*).—Fertilizer experiments with beets and turnips on a variety of soils to determine the extent to which common salt may be used as a substitute for potash salts are reported. Common salt was used at the rate of 480 kg. per hectare (427.2 lbs. per acre) and a 37 per cent potash salt at the rate of 200 kg. per hectare.

The two salts gave practically the same results with sugar beets, although neither materially increased the yield. Turnips showed a smaller potash requirement than sugar beets. Where common salt was used in a complete fertilizer mixture, increases in crop yields were obtained. The conclusion is reached that 37 per cent potash salts may often be replaced by common salt for fodder roots, beets especially. It is also concluded that increased yields produced by additions of potash salts are not due solely to the fact that potassium is an essential nutritive element.

The maintenance of soil fertility.—Liming the corn crop, C. E. THORNE (*Mo. Bul. Ohio Sta., 1 (1916), No. 1, pp. 28–30*).—Continuing field experiments at the station previously noted (E. S. R., 32, p. 31), it was found that the crop of corn was always increased by liming, whether the soil was manured or not. It is stated, however, that the favorable effect of liming on Wayne County soils is not obtained on all Ohio soils. At the Germantown test farm in Montgomery County experiments on the use of fertilizers and lime on crops grown in a rotation of corn, wheat, and clover on an upland clay soil showed that the gain for lime would barely pay for the liming. "At the Miami County experiment farm the effect of lime appears to be somewhat greater than at Germantown, but considerably below that shown in Wayne County. . . .

"While it may be doubtful whether it will pay to use lime for ordinary crops in western Ohio, it will quite generally be advisable to lime the alfalfa crop."

The cost of agricultural lime, C. W. MONTGOMERY (*Mo. Bul. Ohio Sta., 1 (1916), No. 1, pp. 31, 32*).—The costs of obtaining agricultural lime at the Clermont and Hamilton counties experiment farms were found to be governed largely by local conditions.

Data and discussion on the value of activated sludge as a fertilizer, E. BARTOW and W. D. HATFIELD (*Engin. and Contract., 44 (1915), No. 22, pp. 434–436, figs. 4; Jour. Indus. and Engin. Chem., 8 (1916), No. 1, pp. 17–20, figs. 4*).—In connection with experiments noted elsewhere (p. 591) further pot culture experiments (E. S. R., 33, p. 423) with wheat on sand to determine the fertilizing value of activated sludge as compared with that of dried blood when added in amounts furnishing equivalent amounts of nitrogen are reported. The sludge used contained 6.3 per cent total nitrogen, 2.69 per cent phosphoric acid, 4 per cent ether-soluble matter after three hours' extraction, and 11.8 per cent ether-soluble matter after 16 hours' extraction. The growth of wheat fertilized with sludge was much more rapid than that fertilized with dried blood.

A second series of pot cultures comparing the sludge with dried blood, sodium nitrate, ammonium sulphate, and gluten meal confirmed the results of the first experiments. Plat experiments with radishes and lettuce, using equivalent amounts of dried and extracted sludge, showed marked increases in crop with both sludges, the results being slightly in favor of the extracted sludge.

The results of these experiments are taken to indicate that the nitrogen of activated sludge is in a very available form and that activated sludge is valuable as a fertilizer.

Activated sludge experiments at Urbana, Illinois (*Engin. News, 74 (1915), No. 23, pp. 1096, 1097*).—The substance of this article is contained in the above.

The value of filter press cake as a fertilizer, W. E. CROSS and J. A. BELILE (*Rev. Indus. y Agr. Tucumán, 5 (1915), No. 9. pp. 373–380*).—The fertilizing value of sirup sludge from sugar refineries is discussed, and analyses of seven samples are reported which show that the phosphoric acid content varied from 3.04 to 7.81 per cent, the nitrogen content from 1.87 to 2.75 per cent, the lime content from 2.95 to 11.2 per cent, and the organic matter content from 50.77 to 70.98 per cent. Three of the samples contained 5.05, 4.49, and 3.26 per cent of citrate-soluble phosphoric acid. On the basis of these results and those obtained by others it is thought that this material should be of value as a fertilizer, especially for sugar cane.

Report on commercial fertilizers, 1915, E. H. JENKINS and J. P. STREET (*Connecticut State Sta. Rpt. 1915, pt. 1, pp. 1–79*).—This report discusses the fertilizer situation in Connecticut, with special reference to the importance of conservation and use of natural fertilizer resources, and reports and discusses the results of actual and guarantied analyses and valuations of 625 samples of

fertilizers and fertilizing materials offered for sale in Connecticut during 1915, together with analyses of 103 samples of miscellaneous wastes and by-products, including sheep manure, tobacco stems, muck, peat, leaf mold, ground limestone, lime waste from an acetylene gas plant, wood and limekiln ashes, a kelp fertilizer, garbage siftings, gelatin roller waste, glue factory refuse, chimney soot, and ash from the layer of material underlying a peat and lignite bed.

Commercial fertilizers, H. E. Curtis et al. (*Kentucky Sta. Bul. 189 (1914), pp. 631–752*).—This bulletin contains the results of actual and guarantied analyses and valuations of 1,193 samples of fertilizers and fertilizing materials offered for sale in Kentucky during 1914.

"The results of these analyses show that in most cases the samples have come fully up to the guaranty, or where there is a slight deficiency in one ingredient it has been made up by an excess in one or both of the other ingredients. In a few instances the deficiency in one ingredient, while fully made up by an excess of the other ingredients, is still too low to be considered acceptable."

The fertilizer inspection for 1915, B. E. Curry and T. O. Smith (*New Hampshire Sta. Bul. 176 (1915), pp. 3–11*).—This bulletin contains the results of actual and guarantied analyses of 158 samples of fertilizers and fertilizing materials offered for sale in New Hampshire in 1915.

Report of analyses of samples of commercial fertilizers collected by the commissioner of agriculture during 1915 (*New York State Sta. Bul. 410 (1915), pp. 475–550*).—This bulletin contains the results of actual and guarantied analyses of 868 samples of fertilizers and fertilizing materials collected for inspection in New York during 1915.

Analyses of commercial fertilizers, R. N. Brackett et al. (*South Carolina Sta. Bul. 181 (1915), pp. 58*).—This bulletin contains the results of actual and guarantied analyses and valuations of 1,229 samples of fertilizers and fertilizing materials offered for sale in South Carolina during 1914–15. Of these, 288 samples failed to meet the commercial value based on their guaranties.

AGRICULTURAL BOTANY.

The water relation between plant and soil, B. E. Livingston and L. A. Hawkins (*Carnegie Inst. Washington Pub. 204 (1915), pp. 3–48, figs. 3*).—The authors give an account of a study of the relation between the diurnal march of the transpiration rate and the corresponding march of the water-attracting power of the soil in the case of potted plants. Three plants each of vetch, broad bean, and coleus were grown in cylinders provided with automatic irrigators. Weighings and readings of the irrigators, atmometers, etc., were frequently made, and the data tend to show some of the relations between the water requirements of the plants and their surroundings.

In the studies reported, the only immediate conditions markedly altering the soil moisture content were those furnished by the plant itself. These conditions acted through the actual rate of root absorption, which tends to dry the soil layers adjacent to the absorbing surfaces. Aside from growth and other water-consuming processes of the plants themselves, the actual rate of absorption by the roots was found to be controlled by the evaporation rate, which was controlled in turn partly by internal conditions and partly by the evaporating power of the aerial surroundings. The data here obtained bring out an important feature of the daily march of the conditions considered, showing a high region for the day and a low one for the night, although there is a shifting, by a few hours backward and forward, of the time at which the various maxima

occur. It appeared in general that the soil was dried out appreciably by root absorption in the neighborhood of the roots, and that this partial desiccation usually lagged considerably behind its primary cause, rise in transpiration rate. This lag rendered the attraction of the soil for water noticeably high for some time after the transpiration rate had attained its low night value. To what degree the lag occurred in the plant and to what degree in the soil intervening between roots and the irrigator cup has not as yet been determined.

A bibliography is given.

Hourly transpiration rate on clear days as determined by cyclic environmental factors, L. J. Briggs and H. L. Shantz (*U. S. Dept. Agr., Jour. Agr. Research, 5 (1916), No. 14, pp. 583–650, pls. 3, figs. 22*).—In continuation of other studies on water requirements of plants (E. S. R., 32, p. 127), the authors have undertaken a series of transpiration measurements with a view to determining the relative influence of various environmental factors on the transpiration of different plants. The methods and apparatus used were similar to those previously described (E. S. R., 34, p. 226). The present paper deals with measurements of transpiration at Akron, Colo., on clear days in relation to environmental factors, the plants used being wheat, oats, rye, sorghum, alfalfa, and amaranthus. In addition to determining transpiration, records were made of radiation intensity, air temperature, depression of the wet-bulb thermometer, evaporation, and wind velocity.

Composite graphs are presented to show the mean hourly transpiration rate for each of the plants considered. On the basis of the form of the curves, the transpiration graphs may be grouped into two classes having characteristic features. The cereals show marked changes in the form of the transpiration graph in the forenoon, unaccompanied by corresponding changes in the environmental factors. On the other hand, the forage plants and amaranthus give little or no indication of such a change. The flattening of the graphs in case of the cereals is believed to be due to some change in the plant, resulting in a reduction in the transpiration rate below what would be expected from the form of the curve during the early morning hours.

The hourly transpiration rate of cereals on clear days increased steadily, though not uniformly, from sunrise to a maximum value, usually reached between 2 and 4 p. m., after which it fell rapidly to the night level. In the case of sorghum, alfalfa, and amaranthus, the transpiration curves were somewhat more symmetrical, reaching their maximum between noon and 2 p. m., after which they fell approximately with the radiation. When all the mean hourly values were expressed as a percentage of the maximum, the radiation intensity was found to rise in advance of transpiration and to fall either in advance of transpiration or with it, depending upon the plant considered. From this it is considered that radiation may be looked upon as the primary causative factor in these cyclic changes.

If the environmental factors are considered as independent, their relative influence on transpiration, it is said, may be determined by the method of least squares.

Notes on plant chemistry, P. Q. Keegan (*Chem. News, 111 (1915), No. 2899, pp. 289, 290*).—This is a discussion of *Pteridium aquilinum*, *Lychnis dioica*, *Hypericum perforatum*, and *Nymphæa alba*, dealing principally with the chemical constituents of these plants and more or less with their anatomical structures, modes of life, habitats, and products.

Carbohydrate transformations in sweet potatoes, H. Hasselbring and L. A. Hawkins (*U. S. Dept. Agr., Jour. Agr. Research, 5 (1915), No. 13, pp. 543–560*).—In continuation of studies of carbohydrate transformation (E. S. R., 32,

p. 633), the authors give an account of investigations to determine the progress of carbohydrate transformation as influenced by different temperatures, etc. The sweet potatoes were studied during a period of 10 or 12 days, immediately after they had been dug, at 30, 15.5, and 5° C., and a second lot, which had been in storage during the first 12 days, was investigated for another period of equal length after the expiration of the first.

From the data obtained, it appears that in the carbohydrate transformation in stored sweet potatoes, starch is first converted to reducing sugar and cane sugar is synthesized from the reducing sugar. The rates of starch hydrolysis and of sugar synthesized in a general way conform to the Van't Hoff temperature rule for rates of chemical reactions. At high temperatures the reactions are rapid at first, but soon become slower and approach an end point. At low temperatures the rates are slower and the end point is so shifted as to permit a greater concentration of sugar. The reactions are said to be continuous.

In the growing sweet potato the concentration of sugar remains comparatively low, the extensive conversion of starch into sugar apparently being inhibited by the activity of the vines. When the vines are destroyed and the flow of materials to the roots is interrupted, the carbohydrate transformations characteristic of stored sweet potatoes are begun, even if the roots are left in the ground.

Respiration in higher plants, F. W. Neger (*Naturwissenschaften, 3 (1915), Nos. 19, pp. 238–242, figs. 2; 20, pp. 249–253, figs. 3*).—Discussing previous observations regarding the behavior of stomata in relation to gas exchanges, the author states that in case of a fir twig exposed to sulphur dioxid gas after a portion had been partly isolated by bending at a certain point, the foliage of the portion beyond this point was retained in a green state, while that of the other portions became discolored and dropped off, as is common in case of smoke injury. The leaves of the portion beyond the injury were found to have closed their stomata, apparently on account of the partial drying of the leaves.

Experiments with *Euonymus japonica* showed that infiltration occurs more readily in leaves injured by the presence of sulphuric acid evaporating from an aqueous solution thereof than in case of normal foliage. Plants seem unable to protect themselves against noxious gases in the air, the stomata apparently forming the chief means of access to the susceptible tissues of the leaves.

Other factors claimed to be more or less influential in stomatal behavior are discussed, such as illumination, temperature, moisture, age of leaves, daily and seasonal periodicity, transpiration, and altitude.

Two types of leaves are distinguished as significant in this connection, namely, homobaric, in which there is free communication between all the intercellular spaces, and heterobaric, in which sharply defined areas are hermetically sealed apart. The former class corresponds somewhat roughly to the evergreens, the latter to deciduous plants.

Relation of catalase and oxidases to respiration in plants, C. O. Appleman (*Maryland Sta. Bul. 191 (1915), pp. 16, figs. 2; abs. in Jour. Wash. Acad. Sci., 6 (1916), No. 4, p. 101*).—After a review of some of the more important literature relating to catalase activity in connection with respiration, the author gives an account of experiments carried out with potatoes in which he undertook to determine the relation of catalase and oxidase activity in the potato juice and the intensity of respiration in the tubers under different conditions.

The rate of transpiration was found to be influenced by various treatments, and it also varied in different parts of the same tuber and in tubers of different varieties. The data obtained are considered by the author to indicate that the oxidase content of potato juice gives no indication of the intensity of respi-

ration in the tubers, but that catalase activity in the potato juice shows a very striking correlation with respiratory activity in the tubers.

The rôle of oxidases in respiration, G. B. Reed (*Jour. Biol. Chem., 22 (1915), No. 1, pp. 99–111, pl. 1*).—Studies made on several plants are held to show that the oxidation of 1 per cent Spitzer's reagent (an aqueous solution of 1 per cent paraphenylenediamin and saturated α-naphthol) in plant cells frequently proceeds most rapidly in the region of semipermeable membranes, although in many nuclear and all the plastid surfaces observed such activity was absent. The oxidation is not prevented by the destruction of the membranes, but is stopped by the addition of agents which inhibit oxidases.

Experiments with animal tissue are said to indicate that oxidase enzyms are the active agents in the intracellular oxidation observed to proceed after the destruction of the membranes but not after the inhibition of the oxidases.

The view is expressed that if the formation of indophenol may be taken in general as a measure of the total oxidative activity of the cell, it may be concluded that the oxidases are the essential agents in bringing about this reaction.

The distribution of invertase in beets at different stages, H. Colin (*Compt. Rend. Acad. Sci. [Paris], 160 (1915), No. 24, pp. 777–779*).—It was found that in normal beets of the first year, the amount of invertase increased from zero at the collar through the petioles to a maximum in the leaf blades. The central leaves showed the largest proportion, which, however, was slightly exceeded by that in leaves bleached in darkness.

In beets of the second year's growth, invertase increased from zero at the collar through the lower and higher portions of the stem and the leaf blades, reaching the maximum in the inflorescences.

Studies on phototropism, W. H. Arisz (*Rec. Trav. Bot. Néerland., 12 (1915), No. 1–2, pp. 44–216, pl. 1, figs. 17*).—This is an extended account of a study on phototropism in Avena seedlings exposed to illumination from one, two, or all sides, the results from which are discussed in considerable detail.

The final hydrogen ion concentrations of cultures of Bacillus coli, W. M. Clark (*Jour. Biol. Chem., 22 (1915), No. 1, pp. 87–98, fig. 1*).—A further study by the author of the organisms employed in the work reported by himself in connection with Rogers and Evans (E. S. R., 33, p. 631) is described, in which the final hydrogen concentrations attained in the fermentation of dextrose and lactose by several cultures of *B. coli* in a variety of media have been measured electrometrically.

The values obtained agree remarkably for any given medium, and the final hydrogen ion concentrations differ so little that this work is considered as confirming the claim that the final hydrogen ion concentrations are a physiological constant for *B. coli*. The differences which are observed to occur must, however, it is thought, be taken into serious consideration in dealing in any rigid way with the specific effects of the hydrogen ion. It is considered that for certain practical purposes the final hydrogen ion concentrations furnish data of much greater significance than can be obtained by the employment of titrimetric methods to measure the acid productivity of these organisms.

Recent observations on the chondriosomes of epidermal cells of the flowers of Iris germanica, I, II, A. Guilliermond (*Compt. Rend. Soc. Biol. [Paris], 78 (1915), No. 9, pp. 241–249, figs. 17*).—The author describes and figures the various stages of development of chondriosomes in epidermal cells of *I. germanica*, the elaboration of starch, xanthophyll, oil globules, etc., thereby, and the transformation of the chondriosomes into chromoplasts. Brief discussion is also given of the technique employed, which is claimed to render these observations easy of verification.

On the electric charge of the protoplasm and other substances in living cells, J. F. McClendon (*Internat. Ztschr. Phys. Chem. Biol., 1 (1914), No. 3-4, pp. 159–162, fig. 1; abs. in Jour. Chem. Soc.* [*London*], *108 (1915), No. 629, I, p. 109*).—It is stated that although the anthocyanin in the vacuoles of living cells of red cabbage is red and electrically positive, it becomes blue and electrically negative before the death of the cells, which results if alkali be added to the medium. The pigment thus behaves as an amphoteric electrolyte. The electrically negative character of protoplasm has not been shown to be due to its alkalinity, although this is considered possible.

The function of chlorophyll, P. Mazé (*Compt. Rend. Acad. Sci.* [*Paris*], *160 (1915), No. 23, pp. 739–742*).—Previous work (E. S. R., 31, p. 221) has been followed up with studies on maize, in which a nutritive solution of high concentration produced chlorosis and diminution of transpiration.

Chlorosis is thought to be rather a means of defense to the plant against too high temperatures than a purely pathological symptom. Chlorophyll is thought to play a physical rather than a chemical part in the higher plants.

Pollen formation, L. Guignard (*Compt. Rend. Acad. Sci.* [*Paris*], *160 (1915), No. 14, pp. 428–433*).—Reviewing some reported exceptions to the usual modes of cell division in pollen formation, successive bipartition and simultaneous quadripartition, considered as characteristic, respectively, of the monocotyledons and dicotyledons, the author adds to these a number of cases of his own observation in different species and discusses the possible significance of the facts observed.

A new cyanogeniferous genus of the papilionaceous legumes, M. Gard (*Compt. Rend. Acad. Sci.* [*Paris*], *161 (1915), No. 1, pp. 10, 11*).—The author reports the presence of hydrocyanic acid in *Ornithopus compressus* and *O. perpusillus*, and apparently also in *O. roseus* and *O. ebracteatus*.

The acid secretion of the gram plant, Cicer arietinum, D. L. Sahasrabuddhe (*Agr. Research Inst. Pusa Bul. 45 (1914), pp. 12*).—The author has made a study of the secretion on the leaves of the gram plant, said to be the most common of the pulse crops in India. The secretion contains principally acids, of which malic acid constitutes approximately 94 per cent, oxalic acid nearly 6 per cent, and other acids very small proportions.

There is a marked rise in acidity at the time of flowering and another at the time of pod formation, the maximum of acid corresponding to the full development of the pods, just before they begin to dry. The proportion between the acids remained remarkably constant from the tenth to the seventeenth week. Pruning increased considerably the total acidity in the plant, computed on the basis of dry material.

Frequent washing appears to exhaust the acid-producing power of the plant, while washing at periods of six days apparently gives the maximum of product without detriment to its vitality or seed production. It is thought that the production of acid by the plant may reach a point of commercial importance.

Apparently the acid is produced most abundantly on those portions of the plant characterized by certain multicellular knobbed and stalked hairs, which are described.

The physiological action of the salts of aluminum upon plants, E. Kratzmann (*Sitzber. K. Akad. Wiss.* [*Vienna*], *Math. Naturw. Kl., 123 (1914), II, III, pp. 211–233; abs. in Internat. Inst. Agr.* [*Rome*], *Mo. Bul. Agr. Intel. and Plant Diseases, 6 (1915), No. 3, pp. 403, 404*).—This is a report, with discussion, of studies regarding the effect of aluminum on the color of plants, or portions thereof, containing anthocyanin, and on starch formation and plasmolysis,

also of studies regarding the poisonous action of aluminum salts, their effects on the development of fungi, and the question as to whether aluminum is a nutritive element, the results obtained by the author being discussed in connection with those by some other investigators.

Salts of aluminum of 0.005 per cent concentration hindered the growth of *Zea mays, Vicia faba, Lens esculenta, Helianthus annuus*, etc., while 0.0001 per cent somewhat increased growth. Aluminum nitrate showed a toxic effect. Aluminum sulphate in concentrations of 0.005 per cent to 0.1 per cent strongly increased growth and fructification of *Aspergillus niger* in the presence of glycerin, but growth and fructification were checked when glycerin with peptone was added. Aluminum nitrate of 0.01 per cent concentration favored growth of the prothallia of *Equisetum arvense* when these were grown on agar with mineral salts.

The influence of some organic poisons on plant cells, T. WEEVERS (*Rec. Trav. Bot. Néerland., 11 (1914), No. 4, pp. 312–341, fig. 1*).—This is a somewhat detailed account of studies on the effects, at different concentrations and at constant or variable temperatures, of some organic substances on beet root parenchyma.

It is stated that in high dilutions quinin hydrochlorid and chloral hydrate required a very long time to produce fatal effects. Combinations of these and some other organic poisons with organic salts, chiefly of alkali and related metals, were studied, and in these cases the toxicity of the organic poisons was found to be weakened by the presence of the metals. Trivalent ions were more effective than bivalent ions, univalent ions being also without effect. The presence of hydroxyl ions generally opposed the toxicity of the poisons. The combined influence of poisons and salts was noted in both cell membrane and protoplasmic colloids. The possible significance of the observed facts is discussed.

Smelter fumes injury to vegetation, G. P. WELDON (*Mo. Bul. Com. Hort. Cal., 4 (1915), No. 5–6, pp. 240–249, figs. 14*).—The author has collected samples of more than 40 different species of plants, all of which displayed the characteristic forms of bleaching or burning of the leaves due chiefly to sulphur dioxid gas. It is stated that while it is easy to identify cases of severe injury where the plant is exposed constantly to the action of the gas, it is different when the exposure is intermittent, while to determine the extent of the injury is often very difficult or impossible.

Such factors as moisture, winds, air currents, and drafts from canyons are discussed. It is said to be possible often to detect the odor of sulphur dioxid at 20 miles distant from its source, and it is thought that this slight concentration may cause injury by bringing about a weakening of the plants. Striking differences in resistance are noted even in individual trees of the same species.

The effects of this gas upon plants, upon productiveness, and upon the appearance and prosperity of the country are also discussed.

Sexual reproduction, its nature, origin, and consequences, P. A. DANGEARD (*Botaniste, 13. ser., No. 4–6 (1914), pp. 285–325*).—This is a discussion of the phenomena and results of sexual reproduction as seen in higher plants, and of analogous behavior in the lower forms.

The phenomena of sexuality in the Uredineæ, MME. F. MOREAU (*Botaniste, 13. ser., No. 4–6 (1914), pp. 145–284, pls. 14, figs. 3*).—Following a brief sketch of earlier contributions, this article deals mainly with the phenomena of cytogamy, karyogamy, and chromosome reduction, as shown in a variety of species of Uredineæ, and the probable significance of such phenomena in relation to the evolution of sexuality. An extensive bibliography is appended.

The chromosome view of heredity and its meaning to plant breeders, E. M. East (*Amer. Nat., 49 (1915), No. 584, pp. 457–494, figs. 5*).—This is a discussion of data bearing upon the relative importance of the cell nucleus and cytoplasm, the morphological and physiological individuality of the chromosomes, and Mendelian inheritance in connection therewith. The evidence is considered to indicate with a reasonable degree of certainty that the chromosomes are the chief if not the sole bearers of hereditary determinants of body characters, and that their behavior is a rough indication of the mechanism of heredity.

The bearing of the above facts on plant and animal breeding is discussed in regard to the relations of chromosomes to somatic characters, and the relations of normal as well as of peculiar or unusual chromosome behavior to the transmission of characters.

An extensive bibliography is appended.

Inventory of seeds and plants imported by the Office of Foreign Seed and Plant Introduction during the period from July 1 to September 30, 1913 (*U. S. Dept. Agr., Bur. Plant Indus. Inventory No. 36 (1915), pp. 74, pls. 6*).—In this inventory, notes are given of nearly 600 lots of seeds and plants secured from miscellaneous collectors for distribution by the Office of Foreign Seed and Plant Introduction, many of the numbers having come from collections made by Meyer in China and Wight in South America.

FIELD CROPS.

On the influence of planting distance on the yield of crops, F. J. Chittenden (*Jour. Roy. Hort. Soc., 41 (1915), No. 1, pp. 88–93, figs. 2*).—In order to determine the influence of planting distance on crops, plats consisting of three and four rows of turnips spaced 18 in. between the rows and 4 ft. 6 in. between the plats were grown as early and as late crops. Data showing the comparative weights of tops, roots, and whole plant of individual rows are given.

In two cases only, in the 3-row plats, the roots produced by the inner row were of a higher average weight than those of the corresponding outer rows. In no case did the average weight of the tops from an inner row plant exceed the highest of the corresponding outer rows, and in only one case did the total average weight of a plant from an inner row equal that of the highest corresponding outer row.

Data show that in the 4-row plats "in no case did the weight of roots from an inner row exceed that from one or other of the corresponding outer rows, and in only six of the 88 opportunities did it exceed that of the lower of the outer rows. Taking the combined weights of tops and roots, in only two plats did the total weight of an inner row exceed one or other of the corresponding outer rows, and in none was the highest yield given by an inner row. In every case but one the lowest yield on the plat, whether of tops, roots, or total, was in an inner row."

Reclamation of swamp land, J. W. Deem (*Jour. Agr. [New Zeal.], 11 (1915), No. 5, pp. 422–424, figs. 3*).—This article gives a method for transforming swamp land in New Zealand from almost useless grazing country to good cattle-fattening land. The method consists in first draining the land with open ditches; plowing to a depth of 4 or 5 in.; seeding turnips, which are pastured off by cattle and followed with a crop of rape which is pastured; and then sowing with Italian rye grass and clover.

Irrigated agriculture in the San Luis Valley, V. M. Cone and A. Kezer (*Colorado Sta. Bul. 209 (1915), pp. 3–32*).—This bulletin describes the San Luis Valley agricultural conditions and gives suggestions for the production of

alfalfa, peas, wheat, oats, barley, emmer, rye, sugar beets, potatoes, flax, and sweet clover. A chapter is devoted to the injuries to crops caused by the depredations of rodents.

Breeding millet and sorgo for drought adaptation, A. C. DILLMAN (*U. S. Dept. Agr. Bul. 291 (1916), pp. 19, pls. 2*).—This bulletin discusses the place of millet and the saccharine sorghums ("sorgos") in the agriculture of the Great Plains, and gives results of recent breeding work (E. S. R., 24, p. 436) in an effort to produce varieties that would be more drought-resistant than those grown at present.

"The drought adaptation of millet is due largely to its early maturity and low-water requirements, while sorgo has, in addition to these two valuable characteristics, a remarkable ability to endure drought. Even though its growth is severely checked during a period of drought, it will resume growth upon the return of favorable conditions. It has been shown that millet and sorgo require less water for the production of a ton of hay than any other crops that have been tested in the central Great Plains. The Kursk and Siberian varieties of millet have given larger yields of hay than other varieties of this crop tested in the northern Great Plains. In each of these varieties a strain has been selected which is believed to be much superior to the parent stock. . . .

"A strain of sorgo has been developed by selection which is especially promising for this region and for higher altitudes farther south in the Great Plains. In favorable seasons the larger growing sorgos produce a larger tonnage than this dwarf type, but in dry seasons the latter will yield at least as heavily as the larger varieties. This type is very early, maturing seed in a period of about 90 days, and can often be used as a catch crop where other crops have failed. It produces seed freely, and the farmer can easily raise his own supply of seed for forage planting. On account of the smaller size of the plants this dwarf sorgo can very well be planted thicker than the larger growing varieties. This new variety has been named Dakota Amber sorgo.

"Sorgo will probably produce a larger tonnage of fodder than any other annual forage crop of this region. At Akron, Colo., sorgo has produced 40 per cent greater yields than millet. At Newell and Ardmore, S. Dak., also the results have been in favor of sorgo. In a 7-year test at Newell sorgo has produced 51 per cent more fodder than corn. Dakota Amber sorgo has produced on the average 40 per cent more forage per acre than Sudan grass in tests at Newell, Akron, Ardmore, and Mandan. It is believed that Dakota Kursk millet and Dakota Amber sorgo will prove valuable additions to the list of forage crops adapted to the northern and central Great Plains."

Grades of hay and straw (*Cedar Point, Ohio: National Hay Association, Inc., 1915, pp. 12*).—A pamphlet giving the grades of hay, Johnson grass, Bermuda hay, Lespedeza hay, alfalfa hay, and straw, and rules for inspection and weighing.

Farming, with alfalfa bacteria culture, E. W. PHILO (*[Elmira, N. Y.]: Author, 1916, pp. 78, figs. 29*).—A pamphlet in which the author gives his experiences in improving worn-out soils, chiefly by the use of alfalfa and sweet clover. Methods are given for testing the soil, growing bacteria for inoculation, applying bacteria and material to the soil, and pasturing alfalfa with dairy cows, beef cattle, swine, and poultry. Some general topics are discussed, including the production of poultry and potatoes.

Treatment of bean seeds with a solution of iron sulphate, L. E. M. VARGAS (*Estac. Agr. Cent. [Mexico] Circ. 50 (1914), pp. 3*).—A treatment of several varieties of beans with a 1 per cent solution of iron sulphate for five hours

resulted in larger yields than when the beans were treated for three hours. A treatment of the more delicate varieties with a 0.5 per cent solution of iron sulphate for five hours was more satisfactory than the other methods tried.

Corn, M. L. Bowman (*Waterloo, Iowa: Waterloo Publishing Co., 1915, pp. VI+473+XX, pls. 11, figs. 199*).—This is a completely revised edition of the book by the author and B. W. Crossley, previously noted (E. S. R., 21, p. 134).

Further evidence of the immediate effect of crossing varieties of corn on the size of seed produced, T. K. Wolfe (*Jour. Amer. Soc. Agron., 7 (1915), No. 6, pp. 265–272*).—This gives the results of weighings of kernels of crosses made between eight varieties of corn, five of which were white dents and three yellow dents. The factors of dominance of yellow color and of xenia were used to identify the pure-bred from the hybrid seeds on the same ear. Mixed pollen was used in each case.

"The beneficial effect due to crossing varieties in corn frequently appears in the current crop as well as in the first generation, being manifested in the increased weight of the hybrid seeds. In the crosses obtained, 56.8 per cent produced profitable increases in yield (weight of kernels) and in 13.5 per cent the increase was slight. In 24.3 per cent of the crosses the decrease was marked and in 5.4 per cent it was slight. The largest increase was 16.04 per cent and the greatest decrease 13.45 per cent. . . .

"The increases and decreases are not confined to any certain varieties. However, Gold Standard and Collier Excelsior gave decreased kernel weights in a larger number of crosses than any of the other varieties used. All the crosses were made between distinct varieties and not between strains of the same variety. In a previous experiment [at the Virginia Station (E. S. R., 29, p. 533)] larger increases in yield were obtained in the latter case than in this experiment."

Farm practice in the cultivation of corn, H. R. Cates (*U. S. Dept. Agr. Bul. 320 (1916), pp. 66, figs. 40*).—This publication reports an extensive study of cultural practice with corn, in line with that previously noted (E. S. R., 28, p. 233). It gives the results of surveys of 21 regions in the corn belt, each representing about 25 farms, with a view to determining the causes of existing differences in practice. A record was taken from each farmer visited, showing in detail his tillage practices with corn and also the general practices and conditions on his farm. These conditions are discussed and data given in tabular form, but "no attempt has been made to make recommendations based on the results of these studies."

Growing corn in Kansas, C. C. Cunningham (*Kansas Sta. Bul. 205 (1915), pp. 7–46, figs. 10*).—This bulletin gives information based in part on experimental data and in part on the practices of farmers in different sections of the State. The subjects discussed include rotations for corn, varieties, cultural methods, and behavior of corn in storage. A chapter on insects injurious to corn, by J. W. McColloch, is included.

Fertilizer experiments with corn, L. E. M. Vargas (*Estac. Agr. Cent. [Mexico] Circ. 49 (1914), pp. 8, pls. 3*).—Fertilizer experiments carried out in the federal district of Mexico showed that the application of a complete fertilizer, including lime, gave the largest yields per unit area, but that lime, potash, and phosphoric acid without the nitrogen gave the largest net returns.

Community production of Egyptian cotton in the United States, C. S. Scofield, T. H. Kearney, C. J. Brand, O. F. Cook, and W. T. Swingle (*U. S. Dept. Agr. Bul. 332 (1916), pp. 30*).—This bulletin tells how Egyptian cotton production became established in the Southwest as a result of community action, describes the present status of the industry, and gives the reasons for

encouraging the growth of this type of cotton in the United States. Attention is also directed to the conditions which appear to be indispensable to its successful commercial production in this country; that is, under irrigation and in the absence of the boll weevil.

"The history of the establishment of Egyptian cotton production in the Salt River Valley is believed to have more than a special or local interest, since it offers a good illustration of the numerous biological, agronomic, social, and economic difficulties encountered in developing a new agricultural industry and furnishes suggestions as to how these complex and diversified problems may be successfully solved. That cooperation is the keynote of success has become very clear in the progress of the present enterprise." Cooperation has been maintained among investigators, the administrative officers of this Department, growers, and manufacturers.

"The policy of [this Department] in encouraging the production of long-staple cotton on the community basis is beginning to be appreciated by manufacturers and buyers, many of whom now realize that in order to obtain year after year ample quantities of cotton of unchanging character they must look to localities where the farmers are organized to grow only one kind of cotton, to prevent deterioration of the type by seed selection, and to class and market their crop as a unit."

A list of publications bearing on Egyptian cotton growing in the Southwestern States is appended.

Kafir corn ("dari") from South Africa (*Bul. Imp. Inst.* [*So. Kensington*], *13* (*1915*), *No. 3, pp. 379, 380*).—This reports chemical analyses of white, red, and mixed Kafir corn grain, showing the moisture, protein, fat, starch, fiber, and ash contents. The nutritive ratio and food units of the different samples are also given.

Sun-sprouted seed potatoes, W. J. Green (*Mo. Bul. Ohio Sta.*, *1* (*1916*), *No. 1, pp. 15–20, figs. 3*).—This article describes methods of sprouting seed potatoes in partial sunlight before planting. The advantages of seed potatoes so sprouted are claimed as conservation of vitality and early maturity of the crop.

Report of the officer in charge of the Prickly Pear Experimental Station, Dulacca, from May 1, 1914, to April 30, 1915, J. White-Haney (*Ann. Rpt. Dept. Pub. Lands Queensland, 1914, pp. 71–83, pls. 15*).—This is a continuation of work previously noted (E. S. R., 33, p. 233).

A list is given of the materials more or less injurious to the Dulacca pest pear, comprising both solids and liquids which were used as injections, sprays, or vapor charges. The methods employed in the destruction of this weed were the injection of a solid specific or of a liquid specific or solution of specific into the second segment from the top of a branch; the spraying of a specific or a solution of specific over the aerial part of the plant by means of either an ordinary spray pump or an atomizer pump; and the evolution of gas or vapor charges over the aerial parts of the plant. The conclusions drawn are as follows:

"The most effective specific yet applied to the plants in the form of solid injections, liquid injections, or spray, is arsenic acid (arsenic pentoxid). The most effective gas treatment is produced by the fumes of arsenic trichlorid; the best season for the application of poisoning by any of the previously mentioned methods is during the summer and early autumn. The success of the undertaking is largely dependent on the rainfall prior to and after poisoning, probably more especially on the former."

Experiments in the propagation of the wild cochineal insect as a parasite of the pest pear have been tried, but they indicate that there is no possibility of

acclimatizing the insects and inducing them to multiply on and ultimately destroy the weed.

Production and utilization of rape seed (*Bul. Imp. Inst.* [*So. Kensington*], *13* (*1915*), *No. 3, pp. 452–460*).—This article discusses the cultivation of rape (*Brassica campestris*) as a fodder and as an oil-producing plant; gives the properties and uses of rape oil and its substitutes; and discusses rapeseed cake and meal, including chemical analyses. Notes on the trade in rape seed, oil, and cake in the Indian Provinces are also included.

Inflorescence of rice, B. MARCARELLI (*Gior. Risicolt., 5* (*1915*), *No. 23, pp. 372–378, figs. 4*).—This article describes the inflorescence of rice and discusses the phenomena of fertilization.

Dominant and recessive characters in wheat hybrids, H. STRAUSS (*Dominanz und Rezessivität bei Weizenbastarden. Inaug. Diss. Univ. Göttingen, 1914, pp. 52, pl. 1; abs. in Ztschr. Pflanzenzücht., 2* (*1914*), *No. 4, pp. 518, 519*).—This monograph gives results of a study of the awn, color, and hair characters of 30 F_1 hybrid wheats obtained by the use of 10 different varieties at Göttingen in 1913.

It is noted that the generally accepted dominant characters of awnlessness, brown color, and hairiness of the glumes showed many exceptions which may have been caused by accidental selfing. Instead of the awned characters showing complete recessiveness it is noted that a large proportion were intermediate between awned and awnless, 286 plants being intermediate, 29 awnless, and 12 awned. In regard to glume color, the majority (211) showed brown, 17 white, and 45 light brown, indicating an intermediate coloring.

Study of the segregation of hybrid wheat in the F_2 and F_3 generations, A. HENKEMEYER (*Jour. Landw., 63* (*1915*), *No. 2, pp. 97–124*).—This article presents data regarding the awn, color, and hair characters of the F_2 and F_3 generations of six wheat hybrids originally made and studied in their F_1 generation by H. Strauss at Göttingen in 1913, as noted above. Tabular data show the absolute and theoretical ratios of the characters awn and awnless, hairy and smooth, and brown and white glumes for both parents and offspring.

The author concludes that each character considered by itself segregates regularly in the ratio 3:1. When two of the characters are considered combined the ratio follows 9:3:3:1 and when three are considered they segregate in the ratio 27:9:9:9:3:3:1.

Results of seed tests for 1915, F. W. TAYLOR and F. S. PRINCE (*New Hampshire Sta. Bul. 177* (*1915*), *pp. 19*).—This gives results of the testing and analyzing of 42 samples of seed voluntarily sent in and of 80 samples collected by an authorized representative of the station.

The vitality of seeds passed by cattle, D. MILNE (*Agr. Jour. India, 10* (*1915*), *No. 4, pp. 353–369*).—This paper gives results of experiments in feeding whole wheat and gram seeds to bullocks and determining their vitality after being voided by the cattle.

The results of 13 tests with whole wheat show that in some cases as much as 20.5 per cent of the grains passing a single bullock germinated and produced strong healthy plants, while the smallest figure obtained from a single animal was 9.6 per cent. The time required in the case of both wheat and gram for the first appearance of the undigested grains after the experiment began was 13.5 hours. Large numbers of kernels of gram also appeared undigested but practically none of these germinated. Incidentally it was noticed that the seeds of piazi (*Asphodelus fistulosus*), bathu (*Chenopodium album*), and rawari (*Lathyrus aphaca*) were found in the dung, and experiments showed that they germinated.

Turnip weed (Rapistrum rugosum), H. W. ANDREW (*Jour. Dept. Agr. So. Aust., 19 (1915), No. 5, pp. 472–475, figs. 6*).—This article notes the wide distribution and vigorous growth of the turnip weed. It is stated that it often attains a height of 8 ft. under favorable conditions, and may be found in all cultivated fields.

HORTICULTURE.

Tests with nitrate of soda in the production of early vegetables, J. W. LLOYD (*Illinois Sta. Bul. 184 (1915), pp. 29–46, fig. 1*).—In the experiment here reported, which was started in 1907 and continued through six years, top-dressings of nitrate of soda were made to growing crops of radishes, turnips, beets, onions, spinach, lettuce, cabbage, and cauliflower. One plat each of the different vegetables received applications of nitrate of soda at intervals of one week, another at intervals of two weeks, and a third was left untreated as a check. The number of applications of nitrate of soda and the amount of material used varied with different seasons and different crops. The results for each season, as measured by yields, are reported in detail and discussed.

The investigation as a whole leads to the following conclusions: "Under the soil and climatic conditions attending these tests, nitrate of soda usually does not induce an excessive development of foliage on the common early root crops, radishes, turnips, and beets, without a corresponding development of the root. Top-dressings of nitrate of soda may reasonably be expected to have a beneficial effect upon the following crops of early vegetables on well-manured brown silt loam in the corn belt: Radishes, turnips, beets, spinach, cabbage, and cauliflower. The beneficial effect may consist in a higher percentage of plants reaching marketable size or condition within a given time, greater size of the individual specimens, or greater total yields. (If the stand were uniform, the last two points would be correlated.)

"Under the conditions of these tests the benefits to be derived from top-dressings of nitrate of soda to onions and head lettuce do not appear to be sufficiently marked or consistent to warrant the use of this fertilizing material on these crops. Nitrate of soda applied at intervals of two weeks seems to be fully as effective as when applied at more frequent intervals, even though the aggregate amount of material is correspondingly less; in many cases it is more effective.

"Under the conditions of these tests the beneficial results of using nitrate of soda in the production of early vegetables do not appear to be so pronounced as results which have been reported from certain other sections of the country."

Mushroom growing, B. M. DUGGAR (*New York: Orange Judd Co., 1915, pp. VIII+250, pls. 31*).—This work comprises a treatise on mushroom culture and spawn making, together with a classification and discussion of the more important and widely distributed genera and species of mushrooms. Brief accounts are also given of certain cultural practices and exploitations in foreign countries, including some observations on European truffles, African and Asiatic terfas, and a general description of the foreign market for wild mushrooms.

Morphological and biological researches on the cultivated radishes, YVONNE TROUARD RIOLLE (*Ann. Sci. Agron., 4. ser., 3 (1914), No. 6, pp. 295–322, figs. 22*).—A historical study of the cultivated radishes, conducted with special reference to securing some information relative to the origin of this vegetable. A bibliography of cited literature is included.

The present article preceded and is apparently introductory to the full report of the author's morphological and biological researches on the cultivated radishes (E. S. R., 33, p. 638).

Colonial plants.—Alimentary and medicinal plants, H. JUMELLE (*Les Cultures Coloniales. Plantes Alimentaires et Plantes Médicinales. Paris: J. B. Baillière & Son, 1915, rev. and enl. ed., pp. 108+122+127+120+III, figs. 142*).—In the present edition of this work (E. S. R., 31, p. 235) the subject matter, in addition to being revised and enlarged, has been combined in one volume.

Fruit growing.—I, Planting and grafting; II, Pruning of fruit trees, P. PASSY (*Aboriculture Fruitière.—I, Plantation et Greffage; II, Taille des Arbres Fruitiers. Paris: J. B. Baillière & Son, 1915, rev. and enl. eds., vols. 1, pp. 108, figs. 46; 2, pp. 100, figs. 61*).—These are the first two of a series of six volumes which are to comprise, as a whole, a treatise on fruit growing.

Volume 1 is divided into two parts, the first of which deals with nursery practices and the location and establishment of various types of fruit gardens and plantations, and the second takes up in detail the principles and technique of grafting. In volume 2, part 1 deals with the principles and technique of pruning, and part 2 discusses methods of pruning and training the trees into various forms and shapes.

Propagation of fruit trees and shrubs, A. Z. SALVADORES (*Bol. Min. Agr. [Buenos Aires], 19 (1915), No. 8–9, pp. 577–620, figs. 34*).—A popular treatise on methods of plant propagation with special reference to fruit trees, vines, and shrubs.

The summer pruning of a young bearing apple orchard, L. D. BATCHELOR and W. D. GOODSPEED (*Utah Sta. Bul. 140 (1915), pp. 3–14, figs. 2*).—The results for four seasons are given on summer-pruning experiments with apples which were started during the summer of 1911. The work was conducted with 5-year-old Jonathan and Gano trees growing on a rich sandy loam, free from seepage in a semiarid climate, with an abundance of irrigation water available. The Ganos had already borne one crop and the Jonathans came into bearing in 1911. Six Jonathan and 8 Gano trees were included in each of 9 plats.

On the typical winter-pruned plat the trees were pruned in February or March, cutting out the cross limbs, crotches, opening up the center, and thinning out the bearing wood of the tree. No limbs were headed back and no pruning was done at any other season. All plats except the check received this winter pruning. Additional treatment of the several plats included removing suckers from the center of the tree from time to time during the summer, cutting back the excessive growth in the top of the tree to lateral outside limbs with the view of developing the spreading habit, removing the suckers and opening up the dense growth of the tree during the third week in June, and treatments similar to this during the first week in July, the third week in July, the first week in August, and the third week in August, respectively. One plat was left unpruned as a check. Data are given and discussed showing the distribution of twig growth throughout the season and the total growth, as well as the average yield of the trees, under different methods of pruning.

Apple trees which were pruned to induce a spreading habit by cutting back the terminal growth to lateral branches produced a greater annual twig growth than trees without the terminal growth removed, but otherwise similarly pruned. Trees pruned both in the dormant period and in summer produced a greater annual twig growth than trees pruned during the dormant period only. Trees pruned during the dormant period produced a greater total twig growth than the unpruned trees. Although rubbing the water shoots out of the center of the tree from time to time during the summer had practically no influence on crop yield, the shoots are much more readily and cheaply removed at this time than during the dormant period. Trees on which it was attempted to change the form from upright to spreading yielded less than the trees which were allowed to assume their natural upright growth.

Summer pruning resulted in less marketable fruit per tree than either winter pruning or no pruning, and in this orchard has proved neither profitable nor successful in increasing the crop yield. Winter-pruned Jonathans produced more fruit than the unpruned trees, but with winter-pruned Ganos the reverse was true. The effect of summer pruning was practically the same whether performed early or late in the season.

The color of the fruit on the several plats has not varied materially, except on the unpruned plat, where the color has gradually become slightly inferior. The size of the fruit was largely equalized by thinning the fruit on the several plats. Fruit production appears to fluctuate more from year to year on the winter-pruned trees than on either the summer-pruned or the unpruned trees.

Under the conditions of this experiment young, vigorous, bearing apple trees of the Jonathan and Gano varieties show a tendency to overbear soon after reaching a productive age and are usually thinned. Summer pruning reduces the area of fruit-bearing wood, the vitality of the tree, and the productivity.

The handling and shipping of fresh cherries and prunes from the Willamette Valley, H. J. RAMSEY (*U. S. Dept. Agr. Bul. 331 (1916), pp. 28, figs. 11*).—This bulletin gives the results of handling and precooling experiments with sweet cherries and prunes conducted during the seasons of 1911 and 1913 by B. B. Pratt, A. W. McKay, G. M. Darrow, and G. W. Dewey. The investigation, which was carried on in cooperation with the growers in the vicinity of Salem, Oreg., had for its object a determination of the relation of handling and precooling to the decay of the above fruits in transit and on the market when shipped in a fresh state.

The results of the experimental work with both cherries and prunes serve further to corroborate the results of similar work with oranges, lemons, apples, pears, and other fruits (E. S. R., 33, p. 642; 34, p. 235) and to emphasize the great importance of the most careful handling in preparing fruit for shipment. Most of the losses due to mold fungi can be prevented by careful handling. Although the experiments fully demonstrated the value of precooling in reducing losses during shipment, to be most effective the fruit should be properly handled in harvesting, thoroughly and promptly precooled, and transferred to the refrigerator cars without exposure to the warmer outside temperatures.

Directions for blueberry culture, 1916, F. V. COVILLE (*U. S. Dept. Agr. Bul. 334 (1915), pp. 16, pls. 17*).—The present bulletin is a revision of the author's original paper which appeared in 1913 as a part of Circular 122 of the Bureau of Plant Industry (E. S. R., 29, p. 148). This bulletin discusses the special requirements of blueberry plants, importance of superior varieties, methods of propagation, field planting, yields, and profits.

Data are given on the yields and receipts of a 2.5-acre plantation of wild blueberries near Elkhart, Ind., for the period between 1910 and 1915, when the plantation was from 21 to 26 years old. The average for the six years is receipts $243.44 per acre and profits $116 per acre.

In view of the present knowledge relative to the soil requirements of blueberry plants (E. S. R., 24, p. 443), together with the possibility of growing large improved varieties, the author is of the opinion that blueberry culture gives promise as a profitable industry to individual landowners in districts in which general agricultural conditions are especially hard and unpromising. The work conducted with blueberries also suggests the possibility of the further utilization of such lands by means of other crops adapted to acid conditions.

Smyrna fig growing in California, H. MARKARIAN (*Mo. Bul. Com. Hort. Cal., 5 (1916), No. 1, pp. 1–14, figs. 13*).—A popular cultural treatise, including

also a table showing the estimated production of Smyrna figs after the fourth year on different types of soil and at different planting distances.

The olive (Olea cuspidata) forests of the Punjab, B. O. Coventry (*Indian Forester, 41 (1915), No. 11, pp. 391–398*).—A short descriptive account.

Renovation of olive trees; hygiene, pathology, and therapeutics of the olive, C. Benaiges (*Bol. Agr. Téc. y Econ., 7 (1915), Nos. 79, pp. 657–666; 80, pp. 743–752*).—In this article the author briefly discusses the conditions favorable for olive culture and the causes of unproductivity, describes the more important insect pests and diseases of the olive, and gives directions for their control.

Bright v. russet fruit, W. W. Yothers (*Proc. Fla. State Hort. Soc., 28 (1915), pp. 113–117*).—In this paper the author gives some data on several small tests made with grapefruit and oranges which tend to show that in a given length of time bright fruit suffers less from decay and loss in weight from evaporation than russet fruit. Records are also given of three orange groves to show the beneficial effect of spraying for the production of bright fruit, which usually commands a much better market value than russet fruit.

Contribution to the study of coffee, A. Berteau and E. Sauvage (*Rev. Gén. Bot., 27 (1915), No. 317, pp. 129–141, pls. 3, figs. 9*).—The present contribution comprises a study of the structure and method of formation of the fruit and seed of coffee, including an account of the germination process.

Lamtoro as shade, G. A. Alberts (*Meded. Proefstat. Malang, No. 10 (1915), pp. 10, pl. 1, fig. 1*).—The author describes his method of growing lamtoro (*Leucaena glauca*) as shade in a coffee plantation.

The book of hardy flowers, edited by H. H. Thomas (*New York: Funk & Wagnalls Co., 1915, pp. XII+492, pls. 96, figs. 31*).—This work is offered as a simple and complete descriptive guide to the cultivation in gardens of the trees and shrubs and perennial and annual flowers that are hardy or are suitable for planting out-of-doors in summer in temperate countries. The illustrations, which are a feature of the work, show some 200 different shrubs and flowers.

The garden blue book, L. B. Holland (*Garden City, N. Y.: Doubleday, Page & Co., 1915, pp. 425, pls. 2, figs. 176*).—A manual of garden perennials, giving the distinguishing characteristics of each plant, its particular use in the garden scheme, its soil and light requirements or preferences, its relative hardiness, and methods of propagation. The text is fully illustrated and is accompanied by a reference chart in which the plants are grouped according to color of flower and period of bloom, light and soil adaptations, presence or absence of fragrance, and height of the plant. The period of bloom has been calculated with reference to the latitude of Philadelphia. Opposite the description of each plant are blank forms in which the behavior of the plant in any latitude may be recorded for a number of years, and in which the records of additional plants may be placed.

The garden beautiful in California, E. Braunton (*Los Angeles, Cal.: Cultivator Publishing Co., 1915, pp. 208, pls. 14, figs. 13*).—A practical manual of ornamental gardening, prepared with special reference to California conditions.

Ornamentals for winter, Edith L. Hubbard (*Proc. Fla. State Hort. Soc., 28 (1915), pp. 185–191*).—A list of trees, shrubs, vines, hardy palms, scenic plants, perennials, bulbs, and annuals recommended for planting in Florida, with special reference to securing attractive gardens during the winter months.

Use of native plants for ornamental planting, L. P. Jensen (*Gard. Chron. Amer., 20 (1916), No. 1, pp. 17, 18, 29*).—In this article the author calls attention to the large number of native plants available for ornamental planting

and suggests some of the situations in which this plant material may be used to advantage.

The prairie spirit in landscape gardening, W. MILLER (*Illinois Sta. Circ. 184 (1915), pp. 34, figs. 106; Abs., pp. 4, fig. 1*).—In this circular the author aims to show what the people of Illinois have done and can do toward designing and planting public and private grounds for efficiency and beauty.

The first chapter describes a mode of designing and planting which aims to fit the peculiar scenery, climate, soil, labor, and other conditions of the prairies instead of copying the style and materials of other regions. The succeeding chapters discuss various phases of the prairie style of landscape gardening, showing its application to the farmstead and city lot, as well as to regions other than prairies. Information is also given relative to plant materials used with their adaptation for specific purposes, together with a bibliography having some bearing on the prairie style of landscape gardening and descriptive notes on a large number of the more ornamental plants.

The text is fully illustrated with photographic reproductions.

FORESTRY.

Silvicultural work of the steppe experiment forests from 1893 to 1906, G. VYSOTSKIĬ (*Trudy Lîesn. Opytn. Dîelu. Ross., 41 (1912), pp. 1–557; abs. in Zhur. Opytn. Agron. (Russ. Jour. Expt. Landw.), 15 (1914), No. 1, pp. 12, 13*).—This volume contains a description of the natural conditions in the steppe region of Russia, together with the results of forest activities at three steppe experimental forests from 1893 to 1907. In addition to information relative to the composition and growth of forest plantings, data are given on soil studies conducted for a number of years, including analyses of soil solutions taken from areas where the trees failed to grow. See also a previous note by Stepanov (E. S. R., 22, p. 342.)

The importance of phenological observations, G. N. LAMB (*Forest Club Ann. [Univ. Nebr.], 6 (1915), pp. 41–44, pl. 1*).—In this paper the author calls attention to the importance and value of systematic and continuous records of the time of leafing, flowering, fruiting, and leaf falling of the important conspicuous plants as a general index to the seasonal climate in any region. A chart for recording phenological data is illustrated and described. A similar chart, prepared by the author, for 72 of the common species of trees of the eastern United States has been noted (E. S. R., 33, p. 844).

New investigations on the causes of diameter growth in trees, P. JACCARD (*Naturw. Ztschr. Forst u. Landw., 13 (1915), No. 8–9, pp. 321–360, figs. 4*).—Anatomical studies were made of a number of pine trees to determine the correctness of the author's previously advanced hypothesis that the development of any particular form in a tree is an attempt to establish a shaft with equal water carrying capacity (E. S. R., 29, p. 342).

He concludes in brief that the form of the pine stem is influenced primarily by the demands of the water circulation, and the stem between the roots and crown of the tree maintains itself as a shaft of equal water-conducting capacity. In the crown the form of the stem adjusts itself to the constantly diminishing water circulation. Any sudden alteration in the course of water-conducting organs or any strong bending of the tree leads to a readjustment in diameter growth, in order to reestablish uniform water-conducting capacity throughout the area of the stem.

Problems and scope of forest selection, H. REUSS (*Centbl. Gesam. Forstw., 41 (1915), No. 3–4, pp. 81–102*).—A résumé of progress made in breeding and selection as applied to forestry in Europe.

Notes on succession from pine to oak, B. Moore (*Bot. Gaz., 61 (1916), No. 1, pp. 59–66*).—In this paper the author presents observations on the pine and oak woods of Long Island with special reference to the succession of pine stands by oak stands. As a result of this study he concludes in brief that the problem of succession, so far as pine and oak are concerned, involves so many factors, such as previous history of the region, the surrounding vegetation, and the soil and moisture conditions, that the deductions for one locality may be wholly misleading when applied to another locality only a few miles distant.

Nitrogen manuring experiments with 2- and 4-year-old pines, Siefert and Helbig (*Forstw. Centbl. n. ser., 37 (1915), Nos. 2, pp. 83–92; 3, pp. 126–139*).—Data are given on a number of experiments conducted in the forest nursery at Karlsruhe and in open plantings in which various nitrogen fertilizers were used with and without the addition of phosphoric acid and potash.

Examination of the correlation between the evaporation of a pine and the evaporimeter of Wild, A. P. Tolskiĭ (*Trudy Lîesn. Opytn. Dîelu. Ross., 47 (1913); abs. in Zhur. Opytn. Agron. (Russ. Jour. Expt. Landw.), 15 (1914), No. 1, pp. 107, 108*).—In the summer of 1911 parallel observations were made at the meteorological station of the Borov Experiment Forest (Government of Samara) on the evaporimeter of Wild and on the evaporation of a 3-year-old pine transplanted the previous year into a zinc vessel with a tight-fitting cover and provided with a tube for rewatering.

The observations show that evaporation from the pine and that of the evaporimeter were affected by temperature, solar radiation, humidity of the air, and the force of the wind. During the development of young shoots evaporation from the pine did not correspond to the indications of the evaporimeter, particularly in May and June, when the maximum growth in young shoots and needles was taking place, thus indicating a dominating influence of physiological factors over meteorological factors. The greatest evaporation in the pine took place during the morning hours and from the evaporimeter in the afternoon hours.

Recent tapping results with Hevea brasiliensis, A. W. K. de Jong (*Teysmannia, 26 (1915), No. 8–9, pp. 502–510*).—A series of daily and alternate-day tapping experiments were conducted with a number of Hevea rubber trees, the Fickendey process of tapping, which is supposed to increase the yield of latex, being compared with the usual method of tapping over a 6-month period. The Fickendey process consists in brief in the monthly removal of a 3-cm. strip of the cork layer just under the cut. A specially constructed knife is used for this purpose.

The results as a whole indicate that removing the cork layer tends to stimulate the latex flow in the earlier tappings, but that this effect decreases as the tapping continues and results in a smaller total yield over the whole tapping period than with the usual method of tapping.

Timber, from the forest to its use in commerce, W. Bullock (*London and New York: Sir Isaac Pitman & Sons, Ltd. [1915], pp. IX+149, figs. 16*).—This comprises popular descriptive accounts of the timbers which are at the present time dealt with in ordinary commerce. The information given deals with the origin of the timber, its characteristics, commercial importance, and uses.

Notes upon the distribution of forest trees in Indiana, S. Coulter (*Proc. Ind. Acad. Sci., 1914, pp. 167–177*).—This paper discusses the range and distribution of various forest trees in different parts of Indiana.

An annotated reference list of the more common trees and shrubs of the Konahuanui region, V. MacCaughey (*Hawaii. Forester and Agr., 13 (1916), No. 1, pp. 28–34*).—The list here given is said to include all of the commoner

species of native trees and shrubs found in the forested mountains back of Honolulu.

Timber conditions in the Smoky River Valley and Grande-Prairie country, J. A. DOUCET (*Dept. Int. Canada, Forestry Branch Bul. 53 (1915), pp. 55, figs. 20*).—This comprises a report on forest conditions in the Smoky River Valley and Grande-Prairie country, Canada. The survey, which covers an area of over 9,500 square miles, was made in 1913 and continues and connects with the survey work done in 1911 and 1912 (E. S. R., 31, p. 839).

A handbook of forest protection (*[Sacramento]: Cal. State Bd. Forestry, 1915, pp. 87, pl. 1*).—A handbook of information relative to the forest policy of California. It contains the forest laws of the State with interpretations of certain sections, together with a synopsis of the game laws of the State and the forest fire report for the year 1914.

A discussion of log rules, their limitations and suggestions for correction, H. E. MCKENZIE (*Cal. Bd. Forestry Bul. 5 (1915), pp. 56, figs. 8*).—In this bulletin the author discusses many of the different log rules now in use, with reference to the principles upon which they are based and wherein they are defective. Relations are shown, where they exist, between different log rules for the purpose of transforming data from one rule to another.

The author also introduces a new log rule, based on mathematical principles, and designed to be flexible to varying conditions, both in milling operations and in the character of the timber to be sawed.

What chemistry has done to aid the utilization of wood, S. F. ACREE (*Jour. Indus. and Engin. Chem., 7 (1915), No. 11, pp. 913–915*).—In this paper the author gives a popular discussion of the rôle of chemistry in the conversion of waste wood into profitable by-products.

DISEASES OF PLANTS.

Effect of natural low temperature on certain fungi and bacteria, H. E. BARTRAM (*U. S. Dept. Agr., Jour. Agr. Research, 5 (1916), No. 14, pp. 651–655*).—The author reports upon an investigation carried on at the Vermont Experiment Station in which a number of tubes inoculated with different species of fungi and bacteria were exposed during the winter to fluctuating temperatures and tested in the spring of 1913 to determine the viability of the various organisms. This experiment was repeated in 1913–14 with additional species of organisms, the minimum temperature during the winter being reported at —32° C.

Tests were made of the vitality of the cultures on January 17, February 21, and March 27, and it was found that in spite of the exposure to a low temperature *Sclerotinia cinerea*, *Cephalothecium roseum*, *Glomerella rufomaculans*, *Venturia inequalis*, and *Ascochyta colorata* lived through the winter under all conditions of exposure, while four others, *Alternaria solani*, *Cylindrosporium pomi*, *Plowrightia morbosa*, and *Phytophthora omnivora*, lived over on some media but not on others. *Fusarium* sp. from conifers was destroyed by the low temperatures, while *Colletotrichum lindemuthianum* and *Sphæropsis malorum* were so weakened that only under very favorable conditions did they respond to fresh media. Of six kinds of bacteria exposed to the winter temperatures, only two can be safely said to have survived, *Bacillus melonis* and *Actinomyces chromogenus*.

Simple technique for isolating single-spore strains of certain types of fungi, G. W. KEITT (*Phytopathology, 5 (1915), No. 5, pp. 266–269, fig. 1*).—The author describes the media, instruments, and method pursued by himself and others which are considered to be generally applicable to most fungi germi-

nating and growing on agar. These have proved especially useful for the isolation from field material of slow-growing fungi which, with the ordinary method, are likely to be overrun by rapidly growing fungi or bacteria.

The need of a pure culture supply laboratory for phytopathology in America, C. L. SHEAR (*Phytopathology, 5 (1915), No. 5, pp. 270–272*).—In a paper read before the American Phytopathological Society at its summer meeting, the author called attention to the desirability of the establishment of a culture supply laboratory in this country.

Studies on Rhizopus.—II, Physiological, J. HANZAWA (*Mycol. Centbl., 5 (1915), No. 6, pp. 257–281*).—Concluding his report on studies with species of Rhizopus (E. S. R., 28, p. 745), the author states that all the species used except *R. nigricans* grew at blood heat, and he divides them into three groups as regards temperature preference. The reactions of the several species to other conditions are summarized.

All the species studied in this connection were found to grow very well on wounded tomatoes, but poorly or not at all on other living plants or fruits.

Notes on some North American rusts with cæoma-like sori, C. A. LUDWIG (*Phytopathology, 5 (1915), No. 5, pp. 273–281*).—In order to record recent observations on North American rusts which have cæoma-like sori, the author presents keys to the different groups, and notes in particular information relating to the species of Coleosporium, Melampsora, and Cæoma. *Cæoma dubium*, parasitic on the hemlock (*Tsuga heterophylla*), is described as a new species occurring in northwestern United States and western Canada.

Peridermium pyriforme and Cronartium comandræ, J. E. KIRKWOOD (*Phytopathology, 5 (1915), No. 4, pp. 223, 224*).—As a result of field observations and inoculation experiments, the author considers it strongly probable that *P. pyriforme* and *C. comandræ* are alternate phases of the same rust.

Fungus diseases of Colorado crop plants, W. W. ROBBINS and O. A. REINKING (*Colorado Sta. Bul. 212 (1915), pp. 54, figs. 26*).—A description is given of some of the more common fungus diseases, and of injuries not due to fungi, of agricultural and horticultural plants in Colorado, together with suggestions for their control so far as definite methods are known. Formulas are given for the preparation of the various spray mixtures and applications recommended for use.

Work connected with insect and fungus pests and their control, F. R. SHEPHERD (*Imp. Dept. Agr. West Indies, Rpt. Bot. Sta. St. Kitts-Nevis, 1913–14, pp. 15, 16*).—Notes are given on insect pests of sugar cane on St. Kitts, also on root disease (*Marasmius sacchari*) destroying or stunting the canes, and on rind disease, which was present in one locality in 1912 but did not appear during the period covered by this report.

Besides mention of insects injuring cotton, notes are given on a peculiar mottled appearance of the leaves, connected with a stunted growth of the plants, which produced an abnormal number of blooms and bolls, none of which matured. In other places there was a curling or crinkling of the leaves on the upper branches, coupled with entire absence of bolls. This trouble is thought to be the same as the one reported from St. Croix (E. S. R., 31, p. 243), which is supposed to be identical with leaf cut or tomosis described as occurring in the United States.

Cryptogamic review for 1913, G. BRIOSI (*Bol. Min. Agr., Indus. e Com. [Rome], Ser. B, 13 (1914), II, No. 5, pp. 146–157*).—Besides a brief notice of diseases observed in connection with forest, garden, orchard, field, and other plants, about 25 cryptogamic diseases of conifers are listed and given somewhat more extended discussion.

Report by the botanist, W. Small (*Ann. Rpt. Dept. Agr. Uganda, 1914, pp. 59–62*).—This report deals mainly with plant diseases.

The successful use of the sprays noted on page 545 for leaf disease of coffee is reported, the results from the use of other sprays being less satisfactory. The experiments for the purpose of testing the supposed identity of *Hemileia vastatrix* with the Hemileia disease occurring commonly on native coffee gave negative results and are to be repeated.

Hymenochæte noxia, causing root disease of coffee, has not done extensive damage. Sooty mold (*Capnodium brasiliense*) yields to treatment destroying the insects in connection with which it commonly occurs.

The die-back of coffee is thought to be connected with abnormal conditions, but it is considered as somewhat obscure with regard to the manner of its causation. Further studies in this connection are in progress.

Hevea, while remarkably free from fungus diseases, was attacked by a brown root disease in one place. A disease characterized by gummy exudations and bark discoloration was noted in connection with *Phytophthora faberi*. A few cases of die-back of Hevea require further examination, *Glœosporium alborubrum*, *Phyllosticta ramicola*, and *Thyridaria tarda* being noted in this connection.

Cacao stems showed the presence of *T. tarda*, *Megalonectria pseudotrichia*, and *Nectria* spp., and on the pools were found *P. faberi*, *T. tarda*, and *Colletotrichum incarnatum*, but it is not known which of these may cause injury.

The composition of Bordeaux mixture and its soluble copper content, V. Vermorel and E. Dantony (*Prog. Agr. et Vit. (Ed. l'Est-Centre), 36 (1915), No. 19, pp. 438–442*).—This is a further statement regarding studies previously noted (E. S. R., 32, p. 544).

It appears that acid Bordeaux mixture contains basic sulphates of copper, but no hydrates thereof. The alkaline mixtures, as freshly made in the same proportions of copper sulphate and of lime, may present differences as regards composition, showing a blue color and containing a large proportion of hydrates, or a green color, containing abundant basic sulphates or intermediate types. The mixture as used, however, generally contains a sufficient proportion of the dissolved copper to check the development of mildew.

Under the action of carbon dioxid, the alkaline mixture yields at first less copper than does the acid solution, but after a certain time, especially in case of the blue preparation, it yields a considerable amount of soluble copper. If the action of the carbon dioxid is sufficiently prolonged, either the acid or the alkaline mixture shows the formation of the basic carbonate of copper.

It is considered as probable that the acid and the alkaline mixture may have about equal values as fungicides.

The after effect of sulphur treatment on soil, C. D. Sherbakoff (*Phytopathology, 5 (1915), No. 4, pp. 219–222, figs. 3*).—In a previous publication (E. S. R., 32, p. 146), the author gives an account of investigations on the control of potato scab by the application of sulphur. In the present paper, the effect of the sulphur treatment on the growth of subsequent crops, particularly clover, is shown.

Where sulphur was applied at the rate of 900 lbs. per acre in 1912 and 1913, there was a noticeably poorer stand of clover than on adjacent plats; where it was applied at this rate in combination with lime and additional fertilizers, a less injurious effect was shown; and where applied at a greater ratio, no growth of clover at all was observed. The treatments in which sulphur was applied at the rate of 450 lbs. per acre, either alone or in combination, showed an injurious effect on clover only in those parts of the field which were poor in

humus, and in no case was it as marked as where large quantities had been used.

Some noticeable differences in a stand of rye attributed to the use of sulphur are also reported.

Failure of wheat seed to germinate normally, G. P. DARNELL-SMITH (*Agr. Gaz. N. S. Wales, 26 (1915), No. 3, pp. 231, 232*).—Experiments carried out indicate that twisting and consequent failure to emerge from the soil in case of wheat plantlets are due chiefly to deep planting or to setting in case of certain soils. The importance of a properly prepared seed bed is emphasized.

This explanation does not seem to apply to some cases in which the shoot tip appears to have lost its usual property of negative geotropism. It is considered possible that a fungus, probably a Podosporiella, which has been found within the seeds, may be a contributing factor in this connection.

The control of cereal and grass smut and the Helminthosporium disease in Holland and Germany, O. APPEL (*Phytopathology, 5 (1915), No. 4, pp. 230–232*).—The author describes various methods of seed treatment for the control of diseases of cereals and grasses, and he claims that, while Quanjer's method (which consists of spraying the seed grain with a solution of 200 gm. of copper sulphate in 2 to 2½ liters of water for each hectoliter of seed) gives good results in Holland, it is less successful in Germany, where the formaldehyde treatment is preferred. Seed treatment with a 0.1 per cent solution of the mercuric salt of monochlorophenol for 10 minutes is said to be as effective as formaldehyde against stinking smut, but anilin dyes and chinosol are less satisfactory. In case of a light attack of Helminthosporium, the mercuric salt above mentioned and chinosol were used with good results, while in a severe attack in 1912 copper sulphate was more effective than formaldehyde, but did not entirely stamp out the disease. For the control of Fusarium all the fungicides are said to be about equally efficient.

Stem rot of clovers and alfalfa as a cause of "clover sickness," A. H. GILBERT and D. S. MYER (*Kentucky Sta. Circ. 8 (1915), pp. 46–60, figs. 3*).—A description is given of a stem rot of clover and alfalfa due to *Sclerotinia trifoliorum*, a disease which has been under observation in Kentucky for a short time and which is reported as being destructive in certain portions of the State. Methods of control are suggested.

Effect of temperature on Glomerella, C. W. EDGERTON (*Phytopathology, 5 (1915), No. 5, pp. 247–259, figs. 4*).—In connection with previous investigations (E. S. R., 23, p. 250), the author found that the hot summer months in Louisiana prevent the development of the fungus causing bean anthracnose.

Following these investigations, he has considered it desirable to test the bean anthracnose fungus, as well as a number of allied species, under laboratory conditions. Forty-nine cultures of Glomerella from 22 different host plants were grown at various temperatures ranging from 14 to 37.5° C. in Petri dishes on agar made from bean pods. Comparisons were made of the growth of the different species, and it was found that the 49 cultures readily fell into six groups, based upon their optimum temperatures for growth as well as their maximum temperatures.

The form from the banana, *Glœosporium musarum*, has an optimum temperature of 29 to 30°, and a maximum temperature above 37.5°. Forms from various hosts represented by *Glomerella cingulata* and *G. gossypii* grew at an optimum temperature of 27 to 29°, and a maximum temperature above 37.5°. The form on the apple and other hosts that is best known by the name *Glœosporium fructigenum* has an optimum temperature of 24 to 25°, and a maximum of 34 to 35°. Another form growing on the apple is characterized by a lower optimum and maximum temperature and a slower growth. The watermelon

anthracnose fungus, *Colletotrichum lagenarium*, has an optimum temperature of 24° and a maximum of 34 to 35°, while the bean anthracnose, *C. lindemuthianum*, which has the slowest growth of any of the forms, has for its optimum a temperature of 21 to 23°, and for its maximum 30 to 31°.

The ascogenous forms of Glomerella are said to be confined to those groups having most rapid growth. The author believes there are two distinct anthracnose fungi found on apple in the United States which may be readily separated by their temperature reaction, as well as by other differences. The fact that the bean anthracnose will not tolerate high temperatures may be utilized for control of the disease, seed being raised in the fall for spring planting. He states that a large number of forms from various hosts falling in the second group mentioned above can not be separated by the temperature factor, and it is probable that many should not be considered as distinct.

The control of cabbage yellows through disease resistance, L. R. JONES and J. C. GILMAN (*Wisconsin Sta. Research Bul. 38 (1915), pp. 70, figs. 23*).—In this bulletin, the authors give an account of the cabbage yellows due to *Fusarium conglutinans* and also review the experiments carried on for its control by selection of disease-resistant varieties of cabbage, preliminary notes of which have been given (E. S. R., 33, p. 346). The disease, its occurrence, spread, method of infection, etc., are described at length, together with early experiments for its control, after which the experiments in the selection of disease-resistant strains begun in 1910 are discussed in considerable detail.

One strain has been developed, which, it is said, will be distributed on a commercial scale for planting in 1916. In 1914 it gave a practically perfect stand of heads averaging about 5½ lbs. each in a total yield of 18 tons per acre on thoroughly cabbage-sick soil, whereas the best commercial strain grown immediately alongside it produced 80 per cent of yellows and yielded about 2 tons per acre of heads averaging 2½ lbs. each.

Ring spot of cauliflower, A. V. OSMUN and P. J. ANDERSON (*Phytopathology, 5 (1915), No. 5, pp. 260–265, figs. 4*).—The authors call attention to the fact that large quantities of cauliflower are shipped from California to eastern markets, and that practically all of this vegetable received from this source in Boston during the latter part of March and early April was badly affected with the disease known in Europe as leaf spot and in Australia as ring spot. No previous record of the occurrence of the fungus in America seems to have been reported.

The symptoms of the disease, as shown on the material obtained from market, consist of spotting on the outer leaves, although in some cases all the leaves may be infected. In light cases a few spots occur on a leaf, and the leaves show no tendency to turn yellow. On others many spots occur and the leaves lose their green color. Diseased portions, however, retain the natural color, which contrasts sharply with the yellow portion of the leaf.

The disease is said to be caused by *Mycosphærella brassicicola*, a description of which is given. In Europe the pycnidial stage is formed abundantly on the green leaves while the perithecial stage occurs only on the old, dying leaves. The perithecial stage is said to be rare in Europe, while in Australia it is commoner than the other. On the material examined by the authors the perithecial stage was more abundant.

No control experiments seem to have been reported, and, as this trouble appears to be associated with shipping conditions, it is thought that some change in them might retard the development of the fungus.

[A disease of cotton], W. I. HOWELL (*Imp. Dept. Agr. West Indies, Rpt. Bot. Sta. St. Kitts-Nevis, 1913–14, p. 32*).—It is stated that in certain localities on the island of Nevis cotton is affected by a serious disease causing a leaf curl on

the upper branches, particularly in damp weather and in sheltered localities, and entirely preventing the formation of bolls.

Potato diseases and seed potatoes, D. C. BABCOCK (*Mo. Bul. Ohio Sta., 1 (1916), No. 1, pp. 10–14, figs. 3*).—A popular description is given of a number of diseases of potatoes, and spraying, seed selection, and seed treatment are suggested for their control.

[Diseases of prickly pear], T. H. JOHNSTON and H. TRYON (*Rpt. Prickly-Pear Travel. Com., Queensland, 1912–1914, pp. XIII, 18–20, 28, 34, 35, 43, 49–51, 59, 63–65, 84, 86, 90, 91, 92, 93–95, 96, 98, 100, 101, 104, 105, 109, 110, 111, 115–125, pls. 3*).—Such parts of this report are noted herein as refer to diseases and conditions tending to destroy prickly pear or to reduce injury therefrom, as observed or reported at various points visited in both hemispheres by the commission between November 1, 1912, and April 30, 1914.

The commission is led to conclude that disease does not play a very important part anywhere in checking the growth of prickly pear when growing under normal conditions. Observations and studies have been made on several abnormalities due to parasitic agency, and others due to environment, including climatic conditions, which appear to be nowhere of considerable importance in this connection.

Only one prickly pear disease is regarded as of sufficient value to warrant its introduction, namely, anthracnose, shot hole, or black rot, due to *Glœosporium lunatum*. This is common in Texas, and on warm, moist days causes rapid and considerable destruction of young segments and of older joints if previously attacked.

Another fungus, *Sclerotium* (*Sclerotinia*) *opuntiarum*, causes a disease which is somewhat serious in Argentina.

A bibliography is appended containing a few references to diseases of prickly pear.

Blister disease of fruit trees, G. MASSEE (*Roy. Bot. Gard. Kew, Bul. Misc. Inform., No. 3 (1915), pp. 104–107, pl. 1*).—The three stages of the organism causing blister disease of the apple, pear, and cherry are discussed. The somewhat rare ascigerous form (*Diaporthe ambigua*) and the spore-bearing form (*Phoma mali*) are said to be pure saprophytes, the only parasitic form being that previously known as *Coniothecium chomatosporum*. This, it is held, should hereafter be retained only as a form-genus until its components are correlated with their respective Phoma forms.

Frequent spraying with Bordeaux mixture is thought to be sufficient to prevent infection of fruits and young shoots, but the most reliable method is the removal of dead twigs and spurs bearing the fungus.

Outbreaks of grape diseases in 1914, J. CAPUS (*Rev. Vit., 42 (1915), No. 1088, pp. 382–384*).—This is an account of the several appearances, in parts of France, of downy mildew and black rot of grape, the dates of which agree in part, and of the several outbreaks of Oïdium as related to weather conditions.

Employment of hot water against grape parasites, L. RAVAZ (*Prog. Agr. et Vit. (Ed. l'Est-Centre), 36 (1915), No. 18, pp. 414–416*).—This is mainly a statement, with a brief discussion, of the conclusions of Semichon as already noted (E. S. R., 34, pp. 50, 243).

Notes on black rot and downy mildew, L. RAVAZ (*Prog. Agr. et Vit. (Ed. l'Est-Centre), 36 (1915), No. 22, pp. 505–508, pl. 1*).—The development of black rot is described. The mycelium arises in early spring, about the same time as that of the downy mildew, and is able to penetrate the leaf cuticle.

The receptivity of the plant to black rot appears to be related to the nature and character of the material which unites and embeds the epidermal cells. It is thus, apparently, more dependent on the conditions prevailing in the plant

than upon atmospheric conditions, which are largely influential in the case of mildew.

The black rot organism is very resistant to both acids and alkalis.

Studies on grape mildew, L. RAVAZ and G. VERGE (*Prog. Agr. et Vit. (Ed. l'Est-Centre), 32 (1915), Nos. 22, pp. 513–522, figs. 15; 23, pp. 537–544, fig. 1; 25. pp. 584–590, figs. 5*).—Detailing the results of studies carried on for several years with grape downy mildew (*Plasmopara viticola*), the authors state that the first contamination is due to macroconidia issuing from winter spores scattered on the ground. This may be considered as a first invasion, which may occur without the organism reaching the vine. If the zoospores produced by the macroconidia find vegetation sufficiently advanced, they cause the first contamination, whence issues the second invasion, which may be the first of the vine. If the latter is not far advanced, as in case of late varieties, the zoospores die without producing the disease.

To be effective, a copper solution should cover all portions liable to attack. In 1915 the appearance of the conidia was announced five or six days previous to the appearance of the oil spots, giving sufficient time for spraying.

The necessity is pointed out for the prompt recognition and announcement of conditions favoring an outbreak, also the appearance of infecting material and the time for employment of protective measures.

Sprays rich in soluble copper, E. RABATÉ (*Rev. Vit., 42 (1915), No. 1088, pp. 377–381*).—Discussing some results of recent study, the author states that an effective spray for downy mildew is made by adding to a Bordeaux mixture containing 2 per cent of copper sulphate, 0.25 per cent of copper sulphate just before use, 0.25 per cent ammonia, and 0.06 to 0.08 per cent casein diluted in water with as much lime in the form of powder or paste, or 1 per cent molasses in water.

Oïdium or powdery mildew of the vine, F. T. BIOLETTI and F. C. H. FLOSSFEDER (*California Sta. Circ. 144 (1915), pp. 12, figs. 7*).—According to the authors, Oïdium is a serious disease of grapes in California, being found in every vineyard section. In some regions, particularly in the cooler, moister districts, great damage is frequently caused, while in hotter, drier districts, little damage is observed except on the more susceptible varieties.

Experiments are reported in which an attempt was made to control the powdery mildew by sulphuring the vines with a good commercial brand of sulphur applied with knapsack bellows, a liquid spray of sulphur mixed with inert matter so as to cause ready mixture with water, and a winter treatment in which vines were sprayed with a copper sulphate solution. The application of dry sulphur was found most efficient in treating the vines. Winter treatments appeared to be unnecessary and useless. The cost of perfect control with four dry sulphurings was 70 cts. per acre. Directions are given for selecting a good quality of sulphur and for its application.

Treatment for chlorosis, J. LARMEILLÈRE (*Rev. Vit., 42 (1915), No. 1084, pp. 293–295*).—A brief discussion is given regarding the effects of different limy soils in producing chlorosis in grapevines, also of the iron sulphate treatment for the stocks.

Partial pruning and immediate painting of the cut surfaces with an iron sulphate solution of 30 per cent strength (or even 40 per cent in case of older wood) is deemed efficacious if timely, that is, if done while the sap pressure is negative so as to insure ready entrance of the solution. This is said to afford also a degree of protection against the effects of early frost. The treatment is less effective if given soon after a rain. A liberal allowance of iron sulphate spread upon the snow is said to be taken up by the roots with good results, and the addition of sulphuric acid has been found beneficial.

[Coffee diseases in Uganda], T. D. MAITLAND (*Ann. Rpt. Dept. Agr. Uganda, 1914, pp. 18, 19*).—Coffee leaf disease (*Hemileia vastatrix*) was checked and almost eradicated by uprooting the older coffee trees and spraying the younger with Bordeaux and Burgundy mixtures as soon as the growing season set in.

A die-back, apparently a secondary condition resulting from the effects of the leaf disease, was even more serious than that disease itself. Cutting back beyond the dead portion was not effective in arresting the disease, but manurial treatment and rain arrested the die-back, apparently proving its constitutional character.

Changes in coffee grains due to Aspergillus, L. BEILLE (*Proc. Verb. Soc. Sci. Phys. et Nat. Bordeaux, 1912–13, pp. 37, 38*).—The author has found in coffee from Haiti two fungi, connected with a stinking rot of the grains, which appear to be closely related to or identical with *A. niger* and *A. flavus*. Two other organisms causing injury to coffee seeds appear to belong to the same genus, but could not be identified with those above named.

Diseases of lime trees in forest districts, W. NOWELL (*Imp. Dept. Agr. West Indies Pamphlet 79 (1915), pp. 41, pls. 5, figs. 2; abs. in Agr. News [Barbados], 14 (1915), No. 349, p. 302*).—This is a popular discussion of the black root disease due to *Rosellinia pepo* or *R. bunodes*, which may infect the trees by spores or by contact, protection from these fungi requiring careful inspection, isolation as regards contact, destruction of diseased material, and the use of lime and sulphur in the soil as auxiliary agents; red root disease, which is also known to spread by means of underground strands, requiring substantially the same treatment as the foregoing; and pink disease, observed to cause a certain amount of twig blight in sheltered cleanings on estates having a high rainfall.

Walnut blight or bacteriosis, C. O. SMITH (*Mo. Bul. Com. Hort. Cal., 4 (1915), No. 5–6, pp. 254–258, fig. 1*).—Describing the walnut blight due to *Pseudomonas juglandis*, said to have caused losses in California during about 25 years, varying with conditions up to 50 per cent in some cases, the author states that the chief injury is done to the nuts, which are attacked when young, principally at the blossom end or stigma where the surface is not covered with epidermis. Older nuts usually suffer less injury from attacks, which are mainly at other points. Leaves, shoots, and young nursery stock may be attacked, but the chief damage in such cases appears to be that resulting from the consequent dissemination of the disease.

The organism appears to winter in the bark, wood, and possibly the pith of diseased branches, becoming active after the sap starts in the spring, and giving rise to a rather sudden and severe secondary infection. The organism can live over in cloudy weather for several days on the surface of diseased nuts, and is said to be able to withstand from 20 to 50 days of drying in the absence of sunlight. Successful inoculations have been made on *Juglans nigra*, *J. californica*, *J. hindsii*, *J. cinerea*, *J. cordiformis*, and *J. sieboldiana*, also on certain hybrids.

Some spraying experiments with Bordeaux mixture reduced by one-half the number of blighted nuts, while other tests with that fungicide and still others with a mixture of sulphur and potassium hydrate had no perceptible effect. Lime sulphur was not entirely effective, but in some tests a marked reduction of blight was perceptible the second year. The total expense with modern equipment has been reduced to about 50 cts. per tree.

An observed difference between individual trees is thought to indicate their strong resistance or immunity to this disease.

The persistence of viable pycnospores of the chestnut blight fungus on normal bark below lesions, R. A. STUDHALTER and F. D. HEALD (*Amer. Jour. Bot., 2 (1915), No. 4, pp. 162–168*).—It is stated that viable pycnospores of

Endothia parasitica were found on normal bark below lesions in numbers up to 172,222 per square centimeter. Of the 36 pieces of bark tested only 5 failed to yield positive results, and of these 4 were collected 14 days after a rain. Viable pycnospores were found in 23 of 24 tests made during December and January, when no spore horns were present in the field. Abundant viable pycnospores were obtained at 70 cm. (about 27 in.) below a bark lesion. Although most tests were made one or two days after a rain, positive results were obtained with cultures from 5 of 9 pieces of bark tested 14 days after 0.56 in. of rain had fallen.

The chestnut bark disease on freshly fallen nuts, J. F. Collins (*Phytopathology, 5* (*1915*), *No. 4, pp. 233–235, fig. 1*).—Attention was called by the author to the occurrence of chestnut bark disease on old nuts and burs in 1912 (E. S. R., 30, p. 543). Later freshly fallen nuts were found showing blister-like excresences, and cultures were made from some of these, and trees inoculated from some of these cultures.

The data obtained in these experiments indicate that nuts are sometimes infected with this disease before they fall from the tree, and that it would be within the range of possibility to introduce the disease in a new locality by means of discarded shells or kernels of diseased nuts.

Methods of injecting trees, Caroline Rumbold (*Phytopathology, 5* (*1915*), *No. 4, pp. 225–228, pl. 1*).—The author describes the methods used in injecting various chemicals into trees in connection with the investigations carried on for the control of the chestnut blight.

Root rot of coniferous seedlings, A. H. Graves (*Phytopathology, 5* (*1915*), *No. 4, pp. 213–217, figs. 2*).—The author reports the appearance in the nursery of the Yale Forest School, during the spring and summer of 1914, of a serious root rot. About 20 per cent of a bed of one-year-old red pines (*Pinus resinosa*) were destroyed, while 5 per cent of a bed of one-year-old white pines (*P. strobus*), several thousand two-year-old red pines, as well as a few seedlings of one-year-old hemlock (*Tsuga canadensis*) succumbed.

The disease first became noticeable through a dark red or reddish-brown discoloration of the tips of the leaves. By slow degrees this color was extended and subsequently became brown or yellow brown. Diseased seedlings were examined and showed a root system entirely dead.

Repeated efforts were made to isolate a fungus without success, but a study of the soil beds showed that the soil was stiff and clayey. This, together with the fact that the disease caused most destruction early in the season and disappeared when drier conditions prevailed, has led to the conclusion that it is due to the lack of oxygen in a soil which is saturated with water.

Razoumofskya tsugensis in Alaska, J. R. Weir (*Phytopathology, 5* (*1915*), *No. 4, p. 229*).—The author reports *R. tsugensis* as attacking *Tsuga heterophylla* in the Tongass National Forest, Alaska.

Fomes juniperinus and its occurrence in British East Africa, E. M. Wakefield (*Roy. Bot. Gard. Kew, Bul. Misc. Inform., No. 3* (*1915*), *pp. 102–104, fig. 1*).—The author describes two specimens of *F. juniperinus* from East Africa, which is said to be the worst enemy of cedars growing indigenously on the drier slopes at altitudes of 7,000 to 9,000 ft. This organism is said to agree with the description of that noted by von Schrenk (E. S. R., 12, p. 765) as attacking red cedar in the United States.

Telial stage of Gymnosporangium tubulatum on Juniperus scopulorum, J. R. Weir (*Phytopathology, 5* (*1915*), *No. 4, p. 218*).—As the result of culture experiments, the author shows that *J. scopulorum* bears the telial stage of *G. tubulatum*.

Larch mistletoe: Some economic considerations of its injurious effects, J. R. Weir (*U. S. Dept. Agr. Bul. 317 (1916), pp. 25, figs. 13*).—In this bulletin the author gives an account of some of the practical results secured in an investigation of the injurious effects of the larch mistletoe (*Razoumofskya laricis*) occurring in the Blue Mountain region of Oregon and the vicinity.

The deterioration of the western larch in some of the open, exposed stands is said to be due to this mistletoe, which attacks trees of all ages, from seedlings to the unsuberized parts of mature trees. If the infected trees are not entirely suppressed or killed early in life they are so injured as seldom to produce a good grade of timber. Two types of infection are said to occur, one by the seed falling on the branches where witches' brooms develop, and the other by the gradual advance of the cortical root system of the mistletoe along the branch to the younger tissues.

For the control of this pest the author recommends inserting a clause in all timber-sale contracts requiring the cutting of all larches infected with mistletoe, whether merchantable or not.

Trametes pini in India, R. S. Hole (*Indian Forest Rec., 5 (1914), No. 5, pp. 159–184, pls. 8*).—This contains the more important results of a study continued since 1911 on *T. pini* attacking *Pinus excelsa*. Although this disease was first definitely identified in the Punjab in 1904, it is not regarded as of recent origin in India, where it is now causing severe loss.

Infection usually occurs at wounds from wind-blown spores, the spread being greatly favored by the practice of lopping, which is prevalent in the Punjab hills. Natural root grafting, while very common, is not regarded as a very important means of transmission.

Measures recommended are preventive only, the areas which are seriously affected requiring generally complete restocking with resistant trees. Those less seriously diseased are protected by cutting affected trees below the surface of the soil, which is then spread deeply over the cut surfaces. Uninfected forests require hygienic measures and protective belts on sides adjoining infected areas. The establishment of mixed in preference to unmixed pine forests, where practicable, will reduce the danger of infection.

A list is given of species attached by *T. pini* in Europe, America, and Japan, also a short bibliography of this disease.

Degradation of wood by fungi, C. Wehmer (*Ber. Deut. Chem. Gesell., 48 (1915), No. 2, pp. 130–134; abs. in Jour. Chem. Soc. [London], 108 (1915), No. 630, I, pp. 197, 198*).—In pursuance of previous work (E. S. R., 33, p. 651), the author reports the percentage composition of conifer wood after being subjected to the action of Merulius, the results as regards cellulose being still under investigation.

It is stated that free organic acid is absent from rotten wood, the reaction observable being attributed to the presence of humus.

Studies are in progress with *M. sylvester*, *Coniophora cerebella*, and *Polyporus vaporarius*, which also destroy structural timber.

ECONOMIC ZOOLOGY—ENTOMOLOGY.

An account of the mammals and birds of the lower Colorado Valley, with especial reference to the distributional problems presented, J. Grinnell (*Univ. Cal. Pubs., Zool., 12 (1914), No. 4, pp. 51–294, pls. 11, figs. 9*).—This report is based upon three months' work in the field, during which 1,272 specimens of mammals, 1,374 of birds, 443 of reptiles and amphibians, etc., were collected.

The migratory habits of rats, with special reference to the spread of plague, R. H. Creel (*Pub. Health Rpts.* [*U. S.*], *30* (*1915*), *No. 23, pp. 1679–1685, fig. 1*).—A study of the spread of rodent plague in New Orleans which gave evidence that the dissemination of the infection was due to rodent travel led to the investigation here reported.

Two series of experiments were conducted, the first with 179 rats (*Mus norvegicus*), the second with 113 rats. After their ears had been marked for identification they were released, the first in the central residential section of the city and the second in the wholesale provision warehouse district. The first rat of the first lot trapped at any considerable distance was taken within 60 hours at a distance of about one mile from the point of release, having traversed 19 blocks and crossed a main traveled avenue, 150 ft. in width, the travel having been above ground as there was no subsurface conduit. Within two weeks a number of rats were retaken from points four miles distant from the site where they had been released. It is pointed out that the section where the second lot was released afforded fairly ample harborage in the way of wooden culverts, drains, and similar structures in the streets, as well as a large quantity of foodstuffs, such as green vegetables, deposited in the gutters and streets each day. As a result only 8 of this lot of 113 made any extensive travel, although 40 of the lot of 179 made widespread excursions.

"The migratory habits of wild animals are well known in a general way, the phenomena being influenced by weather conditions, a local shortage in food supply, the appearance of an epizootic, or the presence of some natural enemy. Self-preservation presumably is the motive. . . . In addition to obtaining data on rodent migration the experiment furnished an index on the trapping efficiency of the service force; 103 of the 179 rats in the first series were recaptured during the following month and of the 113 in the second series 60 were recaptured in 26 days."

Insects and insecticides, C. P. Gillette and G. M. List (*Colorado Sta. Bul. 210* (*1915*), *pp. 5–55, figs. 41*).—This is a revision of Bulletin 114, previously noted (E. S. R., 18, p. 161).

The toxic values of the arsenates of lead, H. V. Tartar and H. F. Wilson (*Jour. Econ. Ent., 8* (*1915*), *No. 5, pp. 481–486*).—Continuing previous work at the Oregon Experiment Station on the two different arsenates of lead present in the commercial material (E. S. R., 33, p. 801), data are presented relating to the comparative toxic value of the two compounds.

"A comparison of the efficiency values shows that the lead hydrogen arsenate in strengths of 2:50 was quicker acting than the basic, but the results obtained with the latter were satisfactory in that practically the same amount of foliage was eaten in both cases. In strengths of 2:100 the difference in action was greatly in favor of the lead hydrogen arsenate, but only a slight difference was noticed in the amount of foliage destroyed. . . . Further comparison showed that the lead hydrogen arsenate 2:200 was more efficient than the basic 2:100 and that the lead hydrogen arsenate 2:400 was more efficient than the basic 2:200 in the protection of foliage."

[Insect control], F. Sherman, Jr. (*Bul. N. C. Dept. Agr., 36* (*1915*), *No. 6, pp. 67, figs. 10*).—This bulletin, which deals with the San José scale and remedies therefor (pp. 5–26), orchard spraying (pp. 27–50), and orchard protection (pp. 51–58), is a revision of a bulletin previously noted (E. S. R., 28, p. 352).

Some results of the introduction of beneficial insects in the Hawaiian Islands, O. H. Swezey (*Jour. Econ. Ent., 8* (*1915*), *No. 5, pp. 450–457*).—A discussion of the results obtained from the introduction of parasites, particularly those of leaf rollers, sugar cane leafhoppers, cane borers, and fruit fly. Mention

is also made of the control of latana insects by means of eight introduced insects, none of which have become pests on other plants.

Report by the entomologist [of Uganda], C. C. GOWDEY (*Ann. Rpt. Dept. Agr. Uganda, 1913, pp. 29–41*).—This report deals with the insect enemies of coffee, cacao, cotton, and tea, and lists ticks collected and the diseases which they transmit. The report for the year 1914 has been previously noted (E. S. R., 32, p. 847).

[Insect pests of Nyasaland Protectorate], E. BALLARD (*Nyasaland Dept. Agr., 1913, Buls. 1, p. 1; 2, pp. 9; 3, pp. 6; 4, pp. 4*).—These several papers relate, respectively, to the cotton aphis, some cotton and tobacco pests of Nyasaland, the control of insect pests, and pests of stored grain.

Some South Indian insects and other animals of importance, considered especially from an economic point of view, T. B. FLETCHER (*Madras: Govt., 1914, pp. XXII+565, pls. 50, figs. 440*).—This volume is based upon studies carried on by the author while government entomologist at Madras.

The preliminary chapters give a general account of the structure, habits, etc., of insects, the control of insect pests, etc. In the main part of the work some of the more important pests are dealt with, each being considered under the headings of references, distribution in southern India, life history, food plants, status from an economic viewpoint, and control. The work includes a list of crops and the insects attacking each, a list of allied food plants of insect pests, a brief discussion of insects and disease, beneficial insects, and birds and other animals. The life history of a number of the more important insects is portrayed in colors.

Some Javanese galls, J. and W. VAN LEEUWEN-REIJNVAAN (*Marcellia, 8 (1909), Nos. 1–2, pp. 21–35; 4–5, pp. 85–122; 9 (1910), Nos. 1–2, pp. 37–61; 4–6, pp. 168–193; 10 (1911), Nos. 2, pp. 65–80; 3, pp. 81–93; Bul. Jard. Bot. Buitenzorg, 2. ser., No. 3 (1912), pp. 1–52; No. 15 (1914), pp. 68, figs. 230*).—The seven contributions present descriptions of 500 insect galls occurring in Java. Of these the gall formers are represented as follows: Diptera 32 per cent, Acaridæ 26.6 per cent, Thysanoptera 12 per cent, Lepidoptera 6.6 per cent, Aphididæ 6.4 per cent, Psyllidæ 5 per cent, Hymenoptera 3 per cent, Coccidæ 3 per cent, Coleoptera 1.2 per cent, and Heterodera 0.6 per cent.

The insects which attack the leaves of fruit trees, P. LESNE (*Rev. Hort. [Paris], 87 (1915), No. 20, pp. 424–427, pl. 1*).—This brief account is accompanied by a colored plate which illustrates some of the insects which attack leaves of fruit trees and the nature of their injury.

[Insect enemies of prickly pear], T. H. JOHNSTON and H. TRYON (*Rpt. Prickly-Pear Travel. Com., Queensland, 1912–1914, pp. IX–XIII, 14–18, 32–34, 43, 49, 67–81, 86–88, 92, 105–108, 111, pls. 9*).—The authors report upon investigations of the insect enemies of prickly pear in countries where it occurs, made with a view to utilizing the same for the destruction of the plant in Queensland, where it is a pest. Much of the data relating to cactus insects in the United States is based upon a bulletin of the Bureau of Entomology of this Department, previously noted (E. S. R., 28, p. 451).

Dragonflies and their food, A. WARREN (*Proc. Hawaii. Ent. Soc., 3 (1915), No. 2, pp. 72–82*).—This is a report of investigations carried on during the latter part of 1913 and the first part of 1914 for the purpose of obtaining definite data on the range of food of the local dragonflies, particularly *Anax junius* and *Pantala flavescens*.

Tables showing the findings as to the contents of the alimentary canal of 253 nymphs and in the alimentary canal and mouth parts of 24 adults Anax and 218 adult Pantala, with a summarized list of the species and genera which

have been found to contribute to the food of the two species of dragonflies in both nymphal and adult stages, are given. A brief account is also given of the life history of *P. flavescens.*

A study of the food habits of the Hawaiian dragonflies, A. WARREN (*Col. Hawaii Bul. 3* (*1915*), *pp. 45, figs. 55*).—This is a more extended report of investigations by the author than that noted above.

"It was found that the two species of dragonflies studied have a fairly wide food range among the insects of Hawaii. Only four of the twelve possible natural orders of insects are unrepresented in Hawaii. Of the orders present no representatives of the earwig, termites, lace-wing, and grasshopper families were discovered in the food eaten by the dragonflies. This insect might, however, draw on any flying group of insects for its food supply, and there is no doubt that if these researches are continued insects of the excepted groups will be found to be occasionally included.

"In addition to the insect diet, which is shown graphically in the charts, it will be seen that the nymphs feed rather extensively upon other aquatic animals, those identified being Protozoa, Annulata, Mollusca, Crustacea, tadpoles, and fish."

Hoplothrips corticis: A problem in nomenclature, J. D. HOOD (*Entomologist, 48* (*1915*), *No. 624, pp. 102–107*).—The author shows that the name *Thrips corticis*, applied by De Geer in 1773, is valid and points out the changes in nomenclature that must follow. A catalogue which lists all the known species belonging to the several genera affected by the changes in nomenclature is appended.

Insects of Florida, H. G. BARBER (*Bul. Amer. Mus. Nat. Hist., 33* (*1914*), *pp. 495–535, fig. 1*).—This paper, which deals with the Hemiptera occurring in Florida, gives descriptions of eight new species.

The pond lily aphid as a plum pest, EDITH M. PATCH (*Science, n. ser., 42* (*1915*), *No. 1074, p. 164*).—The author has determined that plum migrants (alate viviparous forms) of *Rhopalosiphum nymphææ* readily accept water plantain (*Alisma plantago-aquatica*), arrowhead (*Sagittaria latifolia*), and cat-tail flag (*Typha latifolia*), and that their progeny are perfectly content with the habitat. Thus it appears that the life cycle of *R. nymphææ* includes a residence upon the plum, migrating thence to water plants for the summer and returning to the plum in the fall for the deposition of the overwintering eggs.

It is said to be one of the most troublesome of the plum aphidids occurring in Maine, inhabiting as it does the shoots and ventral surface of the leaves, but exhibiting a tendency to feed upon the young fruit itself as well as tapping the fruit stems.

Pink and green aphid of potato (Macrosiphum solanifolii), EDITH M. PATCH (*Maine Sta. Bul. 242* (*1915*), *pp. 205–223, figs. 3*).—It is pointed out by the author that when an aphidid which in addition to two favorite food plants accepts others not botanically related, as is the case with the pink and green aphidid of potato, the problem of control is considerably complicated by a new element for every different food plant. The food plants of *M. solanifolii* recorded by the author include no less than 20 species, representing 10 families.

This species is found in the spring upon rose bushes, feeding on the succulent growth and especially abundant near the flower buds. Migration may take place through wingless as well as winged individuals, usually occurring in Maine from the first to the middle of July, when a very few scattered individuals may be seen upon the potato. Upon the potato they seem to find the conditions ideal for growth and increase enormously, often covering the tender

tips and blossom stalks thickly with their colonies before the last of August. By the middle of September the fall migration is over and they have deserted the potato fields. While it will colonize upon a variety of plants, part of which are common weeds, the rose seems to be the favorite food plant and it is probable in Maine that this serves most commonly as such for the fall generations of the potato aphidid. In Maine it has never been collected during the spring upon anything but the rose, which would indicate that this is the favorite overwintering host plant and the one ordinarily chosen for the deposition of the eggs in the fall.

During certain summers enormous numbers of this pest have appeared over wide areas on potatoes in Aroostook County, the vines having been attacked to an injurious extent in the vicinity of Houlton and elsewhere. The time of severest attack apparently varies somewhat, but in Maine the infestation has not been excessive before early August and is over before the middle of September. Under conditions favorable to aphidid growth an attack of less than two weeks' duration suffices to kill the potato stalk for a distance of from 4 to 6 in. from the tip and the growth of the tubers on plants thus weakened must necessarily be affected.

The species has been recorded from Canada, Florida, Maine, and California, and various intermediate localities and might be expected to occur in any of the States.

Technical descriptions presented are followed by a report of indoor studies, notes, and a discussion of natural controls and remedial measures. The employment of tobacco extracts is recommended.

Notes on a lime tree aphis, Pachypappa reaumuri, new to Britain, F. V. THEOBALD (*Entomologist, 48* (*1915*), *Nos. 623, pp. 73–76, pls. 2, fig. 1; 624, pp. 116–119, figs. 4*).—The author records the occurrence of this leaf gall former at Bearsted, Kent.

Contribution to the study of the biology of Chermes, P. MARCHAL (*Ann. Sci. Nat. Zool., 9. ser., 18* (*1913*), *No. 3–6, pp. 153–385, pls. 6, figs. 77*).—A detailed report of investigations conducted by the author, together with a bibliography of 73 titles.

Recent tests of materials for controlling San José scale, J. S. HOUSER (*Mo. Bul. Ohio Sta., 1* (*1916*), *No. 1, pp. 21–27, figs. 2*).—A brief review of the present status of control measures for the San José scale, which is summarized as follows: "The home-boiled, dilute lime-sulphur wash, the commercial concentrated lime-sulphur wash (1 part to 7 parts of water), and the soluble oils (usually 1 part to 15 parts of water) are standard scale remedies and will control scale if properly applied. Although our results are somewhat variable, the powdered sulphur compounds are promising and are worthy of careful trial. If, upon further trial, their efficiency is proved as indicated by some of our tests, it seems likely that this class will supplant the concentrated liquid sprays as scale remedies, provided that they can be sold at a comparable figure.

"The inexperienced orchardist uses only about one-fourth to one-third as much spraying material as he should, and most failures to control scale are directly traceable to this fact. One of the most successful orchardists in the State at one time had a bad infestation of scale, but now it is difficult to find a single specimen on his trees. He sometimes sprays his trees from three or four sides, using favoring winds. Many attempt to spray even large trees with the wind in one direction only."

Varying susceptibility of the San José scale to sprays, A. L. MELANDER (*Jour. Econ. Ent., 8* (*1915*), *No. 5, pp. 475–481*).—The author reports upon studies conducted in several localities in Washington State.

The results of preliminary experiments with polysulphids and flour paste in the control of Chrysomphalus dictyospermi pinnulifera on citrus trees, G. Del Guercio (*Riv. Patol. Veg., 7 (1914), No. 5, pp. 129–135; abs. in Internat. Inst. Agr.* [*Rome*], *Mo. Bul. Agr. Intel. and Plant Diseases, 6 (1915), No. 3, pp. 474, 475*).—In experimental control work with this scale, known in Sicily as "bianca-rossa," the author found that the use of 1 to 2 per cent flour paste, fish glue, etc., added to the value of polysulphids in its control. Of the polysulphids that of potash is said to be the most active, even in amounts of less than 1 per cent in the control of the larvæ and 5 to 7 per cent in the control of the adults. The action in July is so rapid that its effect upon the adult scale is apparent from the second day, while the larvæ are destroyed almost instantaneously. This polysulphid, when strengthened with flour, owes its increased destructive property to its great hygroscopicity; thus during the night and early morning it absorbs moisture from the air and its injurious effects on the scale are renewed, while during the day and until nightfall, with the warm air, its action is lessened.

Polysulphid of soda is said to be much less effective than the potash compound, and the impurities which accompany it also prevent its use. Polysulphid of lime alone does not adhere well to very young shoots and leaves or to green branches or fruit. It adheres better to old citrus leaves, but never wets them evenly. When strengthened with glue or flour it does not have the quick action of polysulphid of potash, nor is it so effective, lacking the hygroscopic property of the potash salt. On the other hand, it retains its protective action longer since it is not as easily washed off by rain.

Descriptions and records of Coccidæ, T. D. A. Cockerell and Elizabeth Robinson (*Bul. Amer. Mus. Nat. Hist., 33 (1914), pp. 327–335, figs. 9*).—This article relates largely to Philippine scales. Several of these are described as new, a number being of economic importance.

Observations on British Coccidæ in 1914, with descriptions of new species, E. E. Green (*Ent. Mo. Mag., 3. ser., 51 (1915), Nos. 5, pp. 175, 176; 6, pp. 177–185, pls. 3, fig. 1*).—The notes here presented include descriptions of several new species, and references to several others of economic importance.

A note in regard to Trichodectes hermsi, M. C. Hall (*Proc. Ent. Soc. Wash., 17 (1915), No. 4, pp. 186, 187*).—*T. hermsi* is thought to be a redescription of *T. penicillatus*.

The butterfly guide, W. J. Holland (*Garden City, N. Y.: Doubleday, Page & Co., 1915, pp. 237, figs. 190; rev. in Canad. Ent., 47 (1915), No. 9, pp. 309, 310*).—This is a pocket manual for the ready identification of the common species found in the United States and Canada.

First report on the experiments carried out at Pusa to improve the mulberry silk industry, M. N. De (*Agr. Research Inst. Pusa Bul. 48 (1915), pp. 30, pls. 4*).—A report on breeding experiments conducted at Pusa, India, including a short description of the different races of silkworms reared in that country.

The influence of rainfall and the nonburning of trash on the abundance of Diatræa saccharalis, G. N. Wolcott (*Porto Rico Bd. Agr. Expt. Sta. Circ. 7 (1915), pp. 6, pl. 1; Spanish Ed., pp. 6, pl. 1; abs. in Jour. Econ. Ent., 8 (1915), No. 5, pp. 496–499*).—It is pointed out that the prevalence of the sugar cane borer depends upon rainfall and the presence of trash. Through its destruction of parasites the burning of trash in Porto Rico is claimed to increase the abundance of the borer by 100 per cent.

Spraying notes on the control of the fruit tree leaf roller in the Hood River Valley, L. Childs (*Jour. Econ. Ent., 8 (1915), No. 5, pp. 457–466*).—The limits of infestation of this leaf roller in the Hood River Valley are well-defined, the infestation at the present time comprising from 500 to 600 acres.

The losses are increasing each year with the spread of the pest. The infestation has not as yet occurred to such an extent as to cause noticeable defoliation, but the losses incurred by the worms feeding upon the fruit in several orchards has approached 40 per cent of the entire crop. The injury was even more severe on trees in light bearing, where the percentage of injury amounted to more than 50 per cent.

A series of experiments with lead arsenate, crude-oil emulsion, kerosene emulsion, distillate emulsion, and a miscible oil were carried on in order to determine the most advantageous method of control that could be employed under Hood River Valley conditions. In comparing the results of application of lead arsenate at different strengths it was found that none controlled the leaf roller, although some benefits were derived from an application as weak as 2 lbs. to 50 gal. of water. When used within the bounds of economy, both kerosene emulsion and distillate emulsion were found to be lacking in sufficient penetrating qualities to be of value in destroying the leaf roller eggs. The results obtained with crude oil as a means of control proved disappointing, but those obtained from the use of miscible oil for the destruction of the eggs were highly satisfactory in every way.

Concerning the traubenwicklers (Clysia [Cochylis] ambiguella and Polychrosis botrana), and methods of combating them, E. Schwangart (*Ueber die Traubenwickler (Clysia [Conchylis] ambiguella und Polychrosis botrana) und ihre Bekämpfung, mit Berücksichtigung natürlicher Bekämpfungsfaktoren. Jena: Gustav Fischer, 1913, pt. 2, pp. 195, pls. 9, figs. 9*).—This second part of the work previously noted (E. S. R., 26, p. 655) reports at some length upon investigations of control measures for these grape berry moths, particularly of their natural enemies.

Two new species of Coleophora, C. Heinrich (*Insecutor Inscitiæ Menstruus, 3 (1915), No. 11–12, pp. 143, 144*).—*Coleophora lentella*, reared from a larva found mining the leaves of sweet birch (*Betula lenta*) at Great Neck, Long Island; and *C. gaylussaciella*, reared from a larva found feeding on huckleberry (*Gaylussacia baccata*) at Falls Church, Va., are described as new to science.

Leaf miners, particularly those occuring in Finland, W. M. Linnaniemi (*Acta Soc. Fauna et Flora Fennica, 37 (1913), No. 4, pp. 138, pls. 9*).—An extended account of leaf miners, including reproductions of photographs illustrating their work and a bibliography of 11 pages.

Larch shoot moths (*Jour. Bd. Agr. [London], 22 (1915), No. 1, pp. 50–52, pl. 1*).—A brief description is given of *Argyresthia atmoriella*, its life history, plants attacked, nature of injury, and methods of control.

Some modifications of the hypopharynx in lepidopterous larvæ, J. J. DeGryse (*Proc. Ent. Soc. Wash., 17 (1915), No. 4, pp. 173–179, pls. 3, fig. 1*).

Anopheline surveys.—Methods of conduct and relation to antimalarial work, R. H. von Ezdorf (*Pub. Health Rpts. [U. S.], 30 (1915), No. 18, pp. 1311–1320, pls. 3*).—A description of the method of procedure.

Notes on the species of Culex of the Bahamas, H. G. Dyar and F. Knab (*Insecutor Inscitiæ Menstruus, 3 (1915), No. 8–10, pp. 112–115*).

New Ceratopogoninæ from Peru, F. Knab (*Insecutor Inscitiæ Menstruus, 3 (1915), No. 8–10, pp. 109–111*).

On a dipterous parasite of a mycetophilid larva, W. R. Thompson (*Compt. Rend. Soc. Biol. [Paris], 78 (1915), No. 5, pp. 87–89, fig. 1*).—An undetermined dipteran occurring in France is reported to parasitize the larva of a mycetophilid of the genus Sciara. It is pointed out that only two dipterous species have hitherto been recorded as internal parasites of other dipterans; both are tachinid parasites of tipulids.

A note on the oviposition of Simulium maculatum, H. BRITTEN (*Ent. Mo. Mag., 3. ser., 51 (1915), No. 5, pp. 170, 171*).—The author records observations of the oviposition of this simulid, which he found to creep down the stems of reed canary grass (*Phalaris arundinacea*) and deposit its eggs on the leaves at a depth of about a foot below the surface of the water.

Two new species of Simulium from tropical America, A. H. JENNINGS (*Proc. Ent. Soc. Wash., 17 (1915), No. 4, pp. 199, 200*).

A leaf-mining crane-fly in Hawaii, O. H. SWEZEY (*Proc. Hawaii. Ent. Soc., 3 (1915), No. 2, pp. 87–89, figs. 4*).—Technical descriptions are given of the several stages of a crane-fly (*Dicranomyia foliocuniculator* n. sp.), the larvæ of which mine in the leaves of *Cyrtandra paludosa* and other species of the genus at Punaluu, Oahu.

Eastern Symphoromyia attacking man, R. C. SHANNON (*Proc. Ent. Soc. Wash., 17 (1915), No. 4, pp. 188, 189*).

A new eastern Brachyopa, R. C. SHANNON (*Insecutor Inscitiæ Menstruus, 3 (1915), No. 11–12, pp. 144, 145*).

A new species of Cephenomyia from the United States, W. D. HUNTER (*Proc. Ent. Soc. Wash., 17 (1915), No. 4, pp. 169–173, figs. 4*).—An œstrid reared from larvæ from the nasal passages of a deer (*Odocoileus virgianus texanus*) which was shot in the vicinity of Sabinal, Tex., is described as representing a new species, to which the name *Cephenomyia pratti* is given. It is said to be quite distinct from a new species described by Aldrich in an article previously noted (E. S. R., 34, p. 64) as *C. abdominalis.*

The tachinid fly Mauromyia pulla and its sexual dimorphism, W. R. WALTON (*Proc. Ent. Soc. Wash., 17 (1915), No. 4, pp. 190–193, figs. 4*).

Effect of cold-storage temperatures upon the Mediterranean fruit fly, E. A. BACK and C. E. PEMBERTON (*U. S. Dept. Agr., Jour. Agr. Research, 5 (1916), No. 15, pp. 657–666*).—Following a brief introduction and historical review, the authors report experimental work carried on in 1913, 1914, and 1915 in cooperation with cold-storage plants at Honolulu.

It was found that no eggs or larvæ of the Mediterranean fruit fly survived refrigeration at 40 to 45° F. for seven weeks, at 33 to 40° for three weeks, or at 32 to 33° for two weeks. These data "may lead to the modification of existing quarantines and encourage the refrigeration of fruit subject to fruit fly attack. It seems reasonable to conclude that sooner or later the certification of properly refrigerated fruit will be practicable. When an association of fruit growers or a people find it financially worth while there is no reason why they can not operate a central refrigeration plant under the supervision of an official whose reputation shall be sufficient to guaranty all fruits sent out from the plant to be absolutely free from danger as carriers of the Mediterranean fruit fly."

A preliminary statement regarding wool maggots of sheep in the United States, F. C. BISHOPP and E. W. LAAKE (*Jour. Econ. Ent., 8 (1915), No. 5, pp. 466–474*).—Following a brief introduction and description of the nature of the injury and of the species concerned, the authors consider the seasonal history, life history, and habits of, and control measures for *Phormia regina* and *Lucilia sericata*, both of which have a wide distribution in the United States.

A new American fruit fly, F. KNAB (*Insecutor Inscitiæ Menstruus, 3 (1915), No. 11–12, p. 146*).—*Anastrepha sylvicola*, reared from an unknown fruit found in the forest in Trinidad, is described as new to science.

Synonymical notes on Muscoidea, C. H. T. TOWNSEND (*Insecutor Inscitiæ Menstruus, 3 (1915), No. 8–10, pp. 115–122*).

New genera of muscoid flies from the Middle Atlantic States, C. H. T. TOWNSEND (*Insecutor Inscitiæ Menstruus, 3 (1915), No. 8–10, pp. 97–104*).

Nine new tropical American genera of Muscoidea, C. H. T. Townsend (*Insecutor Inscitiæ Menstruus, 3 (1915), No. 8–10, pp. 91–97*).

The Muscidæ with bloodsucking larvæ, E. Roubaud (*Compt. Rend. Soc. Biol. [Paris], 78 (1915), No. 5, pp. 92–97, figs. 2*).—A brief discussion of this class of Diptera.

Control of injurious aphids by ladybirds in Tidewater Virginia, D. E. Fink (*Virginia Truck Sta. Bul. 15 (1915), pp. 337–350, figs. 6*).—The introduction and colonization of ladybird beetles was undertaken in Tidewater Virginia primarily to aid in the control of the green peach aphis on spinach. Other important aphidids in the region are the cabbage aphis, the bean aphis (*Aphis rumicis*), the pea aphis (*Macrosiphum pisi*), and the potato aphis (*M. solanifolii*). Shipments of lady beetles from California to Norfolk were commenced in 1910. During 1910 and 1911 several colonies of the spotted lady beetle (*Megilla maculata*) and the convergent lady beetle (*Hippodamia convergens*) were liberated, but the largest number of colonies of the convergent lady beetle were established during the years 1913 and 1914. In all 21 colonies were liberated, aggregating a total of nearly 1,000,000 lady beetles. The colonies were placed within a 5-mile radius of each other and were liberated during the early spring.

In this bulletin the author presents information in regard to the life history and habits of these beetles, information relating to which has been previously noted from another source (E. S. R., 27, p. 361). In Tidewater Virginia the convergent lady beetle hibernates in proximity to the feeding areas in weeds, débris, or in the ground. The spotted lady beetle hibernates on trunks and stumps of oak trees. The life cycle of the lady beetle from egg to egg is said to pass in approximately four to six weeks. There are five generations of the lady beetles in Tidewater Virginia, and from April to the middle of July three generations occur. From the middle of July to the end of August practically no breeding takes place, apparently due to scarcity of food; but from the first week in September until very cold weather sets in two more generations may occur, depending largely on the weather.

The introduced lady beetles appear to have been of much value as checks to sporadic outbreaks of aphidids. Where they were colonized no further serious trouble from aphidids has been reported.

A comparative study of a series of aphid-feeding Coccinellidæ, C. P. Clausen (*Jour. Econ. Ent., 8 (1915), No. 5, pp. 487–491*).—The results secured in the investigations here reported, conducted at the Citrus Substation at Riverside, Cal., have led to the following conclusions:

"Temperature and humidity are very strong controlling factors in the development and behavior of the different species. The number of eggs deposited under normal field conditions varies from 200 to 500, and occasionally more, extending over a period of 4 to 8 weeks in case the female lives the full adult life. The period intervening between emergence and mating is 1 to 3 days, and from mating to oviposition 8 to 11 days. A period of 10 to 15 days thus intervenes between emergence and the beginning of oviposition. Oviposition normally takes place daily, with occasional exceptions. The number of aphids eaten by the larvæ of the different species varies approximately with the size of the individuals, the number varying from 216 to 475 for the entire larval period. The above to a somewhat lesser extent is true of the adults also."

The corn silk beetle, Luperodes varicornis, and its control, R. W. Harned (*Jour. Econ. Ent., 8 (1915), No. 5, pp. 507, 508*).—This beetle is reported to have appeared in enormous numbers in many corn fields of several counties in Mississippi, where it eats the silk just as it grows out from the ear, and while

it is fresh and succulent. Dry Paris green shaken directly upon the silk was found to be a satisfactory remedy.

Beetle borers of sugar cane, E. JARVIS (*Queensland Agr. Jour. n. ser., 3 (1915), No. 1, pp. 32, 33*).—A brief account is given of two beetle borers of sugar cane in New Guinea, namely, *Cryptorhynchus* sp. and *Rhabdocnemis* sp., technical descriptions of which will be published later.

Notes on the habits and anatomy of Horistonotus uhlerii, J. A. HYSLOP (*Proc. Ent. Soc. Wash., 17 (1915), No. 4, pp. 179–185, figs. 12*).—The data and description of the larva here presented supplement the account previously noted (E. S. R., 32, p. 555).

Dung-bearing weevil larvæ, F. KNAB (*Proc. Ent. Soc. Wash., 17 (1915), No. 4, pp. 193, 194*).

A preliminary list of the Coleoptera of the West Indies as recorded to January 1, 1914, C. W. LENG and A. J. MUTCHLER (*Bul. Amer. Mus. Nat. Hist., 33 (1914), pp. 391–493*).—This list of West Indian Coleoptera includes an index of families and genera.

Queen rearing in England with notes on a scent-producing organ in the worker bee and how pollen is collected by the honeybee and bumblebee, F. W. L. SLADEN (*London: Madgwick, Houlston & Co., Ltd., 1913, 2. ed., pp. VIII+86, pls. 3, figs. 47*).—This account of the rearing of queen bees includes a discussion of shipping by mail, races of bees, drone rearing, and breeding for improvement.

The ants of Haiti, W. M. WHEELER and W. M. MANN (*Bul. Amer. Mus. Nat. Hist., 33 (1914), pp. 1–61, figs. 27*).—Ninety forms are recorded of which 37 and one genus are described as new. It is stated that 47, or 52.2 per cent of all the forms, are known only to the republic of Haiti and the Dominican Republic.

Investigation of spread of fruit fly parasites in Kona, Hawaii, W. M. GIFFARD (*Proc. Hawaii. Ent. Soc., 3 (1915), No. 2, pp. 90–93*).—A detailed account of investigations of the distribution of *Opius humilis* and *Diachasma tryoni* throughout the coffee fields of South and North Kona, an account of which has been previously noted (E. S. R., 32, p. 757).

Some hyperparasites of white grubs, O. H. SWEZEY (*Proc. Hawaii. Ent. Soc., 3 (1915), No. 2, pp. 71, 72*).—A bombyliid determined as *Anthrax fulvohirta* and a male and female mutilid, determined, respectively, as *Mutilla castor* and *M. ferrugata*, but probably sexes of one and the same species, were reared by the author from cocoons of *Elis sexcincta* which had been collected at Urbana, Ill.

A preliminary list of the hymenopterous parasites of Lepidoptera in Hawaii, O. H. SWEZEY (*Proc. Hawaii. Ent. Soc., 3 (1915), No. 2, pp. 99–109*).—This is a report of the author's observations made during his work in rearing larvæ in life history studies of Hawaiian Lepidoptera during the past ten years.

Notes on North American Mymaridæ and Trichogrammatidæ, A. A. GIRAULT (*Ent. News, 27 (1916), No. 1, pp. 4–8*).—*Abbella auriscutellum* reared from the eggs of *Draeculacephala mollipes* at Tempe, Ariz.; *Oligosita sanguinea claripes*, a secondary parasite of *Asphondylia miki* on alfalfa seed at Sacaton, Ariz.; *Lathromeroides neomexicanus* reared from jassid eggs at Las Vegas, N. Mex.; and *Xenufens ruskini* reared from the eggs of *Eudamus proteus* at Lakeland, Fla., all described as new to science, are among the more important of the 18 forms here noted.

Parasite of Bellura obliqua, HERMAN H. BREHME (*Ent. News, 26 (1915), No. 10, p. 473*).—Twenty-nine of 40 larvæ of *B. obliqua* collected by the author at Cliffwood, N. J., were parasitized by *Hypostena tortricis*.

Three new species of Coccophagus, family Encyrtidæ, A. A. GIRAULT (*Ent. News, 27 (1916), No. 1, pp. 33–35*).—*Coccophagus magniclavus* reared from *Aleurochiton* sp., at Berlice, Demerara, British Guiana; and *C. mexicanus* and *C. coxalis* taken on a fig lecanium at Porto Bello, Panama, are described as new.

Macrosiagon flavipennis in cocoon of Bembex spinolæ, H. S. BARBER (*Proc. Ent. Soc. Wash., 17 (1915), No. 4, pp. 187, 188*).

The life cycle of the Dryinidæ, hymenopterous parasites of Homoptera, D. KEILIN and W. R. THOMPSON (*Compt. Rend. Soc. Biol. [Paris], 78 (1915), No. 5, pp. 83–87, figs. 10*).—This article deals with hymenopterous parasites of the Fulgoridæ and Jassidæ.

The formation of hymenopterous plant galls, W. MAGNUS (*Die Entstehung der Pflanzengallen verursacht durch Hymenopteren. Jena: Gustav Fischer, 1914, pp. 160, pls. 4, figs. 32*).—The first or special part (pp. 4–118) of this work dealing with the galls and gall formers of the families Cynipidæ, Chalcididæ, and Tenthredinidæ is followed by a more general discussion (pp. 119–157).

Ametastegia glabrata, a holarctic sawfly, S. A. ROHWER (*Proc. Ent. Soc. Wash., 17 (1915), No. 4, pp. 198, 199*).

The mating habits of some sawflies, S. A. ROHWER (*Proc. Ent. Soc. Wash., 17 (1915), No. 4, pp. 195–198, pl. 1, fig. 1*).

FOODS—HUMAN NUTRITION.

Biochemical comparisons between mature beef and immature veal, W. N. BERG (*U. S. Dept. Agr., Jour. Agr. Research, 5 (1916), No. 15, pp. 667–711, figs. 6*).—The object of the investigation here reported was to ascertain whether the flesh of calves three weeks of age and under is fit for human food. Forty-one calves 7 days old or less were used for making the analyses, the artificial digestion tests, and feeding experiments with cats. The results are summarized as follows:

"During the study of the chemical composition of mature beef and of immature veal, no differences between them that are physiologically significant were detected.

"In a large number of artifical-digestion experiments immature veal digested as fast as mature beef. The speed of digestion was measured by three different methods [which are described in detail].

"Cats were fed on a diet in which immature veal was the sole source of nitrogen. The young animals grew normally on the diet; the older ones became fat. A pair of cats, after living two-thirds of a year on the diet, produced a litter of healthy young kittens, which, after the nursing period, continued on the immature-veal diet, with excellent growth.

"The work indicates that immature veal, when properly prepared, is fit for human food, especially when its deficiencies in fat and possibly in small amounts of undetermined constituents are counterbalanced in the ordinary mixed diet."

A list of the cited literature is appended.

The tilefish: A new deep-sea food fish (*U. S. Dept. Com., Bur. Fisheries Econ. Circ. 19 (1915), pp. 6, figs. 2*).—Information is given regarding the appearance, disappearance, and recurrence of *Lopholatilus chamæleonticeps*, popularly known as the tilefish. Twelve recipes are given for the preparation of this fish for the table.

The preparation of protein-free milk, H. H. MITCHELL and R. A. NELSON (*Jour. Biol. Chem., 23 (1915), No. 2, pp. 459–467*).—A method is described for the preparation of protein-free milk for experimental purposes.

Studies in the adaptation of an artificial food to human milk, H. J. GERSTENBERGER, H. D. HASKINS, H. H. MCGREGOR, and H. O. RUH (*Amer. Jour. Diseases Children, 10 (1915), No. 4, pp. 249–265*).—In this article are described the analytical, bacteriological, physical, mechanical, practical, and clinical data obtained in work on the preparation of an artificial milk—termed by the authors "G-R milk."

"By mixing varying proportions of different animal and vegetable fats, it is possible to get a fat that in its Reichert-Meissl number (small percentage of low volatile fatty acid glycerids), saponification number, iodin number, and other characters, is nearly identical with the fat of human milk, as has previously been shown by Arnold. By replacing in an artificial milk cow's-milk fat, with the fat of the above description in an emulsified state (homogenized), a distinct step in advance toward the more complete adaptation of an artificial food to breast milk is made.

"It is also possible to take into consideration the 'growth factors,' 'vitamin factors,' and the like, in choosing the individual fats for an acceptable mixture. This represents a further step in the more complete adaptation of an artificial milk to human milk.

"The homogenizer represents the important means by which the mixing and emulsification of the fat in the artificial milk is possible. The homogenizer also changes the physical condition of the fat (smaller globules, brownian movement), which may be of advantage.

"The meager clinical data suffice to show that the infants fed with Friedenthal's milk in which the cow's-milk fat has been replaced by a fat with a low volatile fatty acid glycerid content, similar to that of human-milk fat, vomit less and have more normal stools than the children reported by Bahrdt and fed with Friedenthal's milk containing unchanged cow's-milk fat.

"Washing butter with cold or hot water does not remove the low volatile fatty acids from butter, except in an insignificant degree. Washing butter with hot alcohol does remove the low fatty acid glycerids to a decided degree.

In the opinion of the authors, such a food can be produced to give a very low bacterial count and at a reasonable cost.

Milling and baking tests of wheat containing admixtures of rye, corn cockle, kinghead, and vetch, R. C. MILLER (*U. S. Dept. Agr. Bul. 328 (1915), pp. 24, pls. 2, figs. 10*).—This bulletin reports the results of experiments made to determine the effects upon the baking quality of wheat of the presence in it of varying amounts of rye, corn cockle, kinghead, and wild vetch, which are considered as inseparable impurities, since they are not readily removed by the ordinary grain-cleaning machinery. It is also generally claimed that the presence of these substances in wheat affects the baking quality of the flour milled from it. Descriptions of the different impurities as well as general information regarding their occurrence are given.

The results are first reported of an examination of samples of wheat from the crops of 1911, 1912, 1913 to determine the percentages of these impurities present.

Comparative milling tests were made to determine the percentages of bran, shorts, and straight flour yielded by rye, corn cockle, kinghead, and wild vetch, and also by wheat as a comparison. The results of the tests showed that "a relatively low yield of flour was secured when each impurity was milled by itself, especially in the test with kinghead seed, from which less than 16 per cent of flour was obtained."

Milling and baking tests, which extended over a period of three years, were carried out with wheat alone and with wheat to which had been added varying percentages of each of the impurities. In order to have a basis for comparison

a sufficient amount of wheat of one variety was purchased to make all the milling tests for each year. From the results of these tests, which are presented in detail, the author concludes that the presence of more than 2 per cent of any of these impurities in wheat as milled is detrimental to its milling and baking qualities. The deleterious effects of rye are, however, less pronounced than those of corn cockle, kinghead, or vetch seed. The presence of 2 per cent or more of rye lowered the quality of the bread. Other conclusions drawn are as follows:

"Corn cockle seems to have exceedingly injurious effects on the volume, color, and texture of the loaf, and when present in amounts of 3 per cent or more reduces the percentage of water absorption of the flour. Kinghead in wheat in appreciable amounts materially lowers the flour yield, and the detrimental effects of this impurity in the flour are especially noticeable in the dirty color of the crumb and the coarse, uneven texture of the bread baked from such flour. Vetch seed in wheat will reduce the size of the loaf and give to the bread a yellowish tinge and a disagreeable odor and flavor characteristic of vetch.

"Corn-cockle seed is a more objectionable impurity in wheat than rye, kinghead, or wild vetch, since it contains a poisonous element known as saponin, or sapatoxin, the presence of which is very undesirable in flour or bread."

Chemical analyses of the wheat, of the impurities, and of flour containing admixtures of the impurities were made and the results indicated that "the flour from the different impurities was distributed to some extent in all three grades of flour, a larger proportion in most instances going into the first-clear and second-clear flours."

The milling of rice and its mechanical and chemical effect upon the grain, F. B. WISE and A. W. BROOMELL (*U. S. Dept. Agr. Bul. 330* (*1916*), *pp. 31, figs. 11*).—The first part of this bulletin contains a detailed description of the physical and microscopic structure of the rice grains as well as a discussion of the evolution of methods of rice milling. The more primitive methods and the various steps of the modern process, especially the different machines employed, are described at length.

In a study of the mechanical effects of milling upon the rice grains 56 series of sampes of rice of the Honduras type and 25 similar series of samples of the Japan type were secured from modern mills in various parts of the rice-growing belt. These represented various grades and qualities of rough rice. For the purpose of comparison, these samples were divided according to the size of the particles into five divisions, as follows: Whole grain, $\frac{3}{4}$ grain, $\frac{1}{4}$ grain, $\frac{1}{3}$ grain, and less than $\frac{1}{3}$ grain; the weight of each division and the percentage it formed of the whole sample being determined. To determine the effect of milling on the weight of the kernels, 9 series of samples of the Honduras type and 5 series of the Japan type of rice were examined, 250 whole grains being counted and weighed and from this the weight of 1,000 grains calculated. The results of these tests may be summarized as follows:

"Excessive breakage occurs when rice of the Honduras type is milled in a 'plantation huller,' and the finished product may have less than 10 per cent of whole grains. The Honduras type of rice milled in a modern plant is broken to a considerable extent during the scouring process, which reduces its whole-grain content from 75 per cent as it leaves the paddy machine to 50 per cent as it leaves the brush. The Japan type of rice, on account of its shape, is broken to a less extent, and under similar conditions averages 92 per cent and 80 per cent, respectively, of whole grains.

"Approximately 10 per cent of the weight of the rice kernels of both Honduras and Japan types is removed by the scouring off of bran coat and germ.

In other words, the average weight per thousand kernels of rice of the Honduras type is reduced from 24.1 to 22.8 gm. by the action of the hullers and pearling cone, and then to 22.1 gm. by the brush. The hullers and pearling cone reduce the weight of the grain of Japan rice from 22.4 to 21.5, and the brush further reduces the weight to 20.2 gm."

Chemical analyses were made of 4 series of milled samples of Honduras rice and 3 of Japan rice, obtained from various parts of the rice-growing belt. Each series was made up of samples taken at various stages in the milling process. The results are also reported of chemical analyses of samples of the Japan type of rice, which had been milled in "plantation hullers." Analytical data regarding all of these samples are reported in detail.

"Chemical analyses show that the old mortar-and-pestle mills removed a somewhat smaller prportion of ash, ether extract, and crude fiber from the grain than was the case with the 'plantation huller' or than is done in the modern mill.

"In the modern mill the brown rice from the paddy machine loses a considerable proportion of certain of its constituents in its passage through the scouring machines. There is thus removed from the brown rice about 70 per cent of its ash, 85 per cent of its fat or oil, 70 per cent of its crude fiber, 10 per cent of its protein, and 30 per cent of its pentosans."

In the latter part of the bulletin, information is given regarding the commercial grading of rice and the results are reportsd of mechanical and chemical analyses of milled rice and its by-products.

"The grading of milled rice is based largely on the percentage of whole grains or the size of particles. The four commercial grades of the Honduras type of rice generally made are (1) fancy head, or 'head,' (2) second head, (3) screenings, and (4) brewer's rice. Other grades sometimes made are extra fancy head, or triple-screened, and line rice. The whole-grain content of the fancy head grade averages about 80 per cent and its mill yield 59 lbs. per barrel of rough rice. Second head, screenings, and brewer's rice are largely broken grains of different sizes, and their average yield is 19, 15, and 8 lbs., respectively.

"Three commercial grades of the Japan type of rice are generally made. These are (1) fancy head, or 'head,' (2) screenings, and (3) brewer's rice, with mill yields approximating 96, 5, and 5 lbs. per barrel, respectively. The fancy head grade averages 90 per cent of whole grains; the other grades are similar to the corresponding separations produced from the Honduras type of rice.

"The mill yield of rice hulls approximates 30 lbs.; of rice bran, 20 lbs., and of rice polish, 6 lbs. per barrel of rough rice.

"Chemical analyses of the several samples representing various commercial grades of rice show a silghtly smaller percentage of ash, ether extract, and crude fiber in the higher than in the corresponding lower or more broken grades of both Honduras and Japan types of rice. The percentage of protein in the milled Honduras type of rice appears to be somewhat higher than that in milled Japan rice.

"Rice hulls contain but little ether extract or protein, but are very high in ash, crude fiber, and pentosans. Bran and polish are rich in fat and protein, and when fresh and not adulterated with hulls are considered an excellent stock feed."

A bread leavening agent, C. J. Külümoff (*Centbl. Bakt.* [*etc.*], *2. Abt., 34* (*1912*), *No. 1–3, pp. 76, 77*).—The author describes the preparation and properties of a fermentation liquid obtained from the chick-pea (*Cicer*

arietinum). It is widely used in Bulgaria and Turkey as a substitute for yeast in the preparation of chick-pea bread.

The nutritive value of wood, G. HABERLANDT (*Sitzber. K. Preuss. Akad. Wiss., 1915, pp. 243–257; abs. in Zentbl. Biochem. u. Biophys., 18 (1915), No. 4, pp. 105, 106*).—The author states in this article that maple, poplar, elm, linden, and birch woods contain the largest supply of reserve material for use as food. This material becomes available to the body only when the cell walls of the wood are broken down, so that careful milling is absolutely necessary. Chemical analyses of different kinds of wood are given and microscopical studies reported.

Physiological-chemical suggestions as to the use of food materials during the war, T. BOKORNY (*Naturw. Wchnschr., 30 (1915), Nos. 28, pp. 433–440; 29, pp. 456–461*).—In this summary and digest of data, extensive information is given regarding the chemical composition and energy value of the most common foods. The demand for protein, fat, carbohydrates, and the different inorganic salts, and energy requirements under various living conditions, are considered and examples given of the use of foods suitable to meet the specific requirements of the body.

The nutrition of the school child, G. A. BROWN (*Jour. State Med., 23 (1915), Nos. 11, pp. 329–335; 12, pp. 353–358*).—Among the factors studied with reference to their possible effect upon the nutrition of the child were the nutrition and general health of the mother during the antenatal period, the industrial occupation of the mother, and housing and economic conditions.

The results are reported of a study of the family budgets and dietaries of 60 households. The average daily energy value of all the diets studied was 3,163 calories, and the principal foodstuffs used were bread, potatoes, milk, sugar, beef, and vegetables, including relatively small amounts of oatmeal, peas, beans, etc.

The following conclusions are drawn, in part:

"The condition of the mother, respecting nutrition and general health during pregnancy, has a far-reaching influence on the nutrition of the child. Antenatal causes of defective nutrition may act for an indefinite period after the birth of the child. The industrial occupation of the mother has a detrimental effect on the nutrition of the children.

"Housing is related to the state of nutrition of the child. The children from the largest houses are, on the average, heavier and taller than their less fortunate fellows. The poorest children suffer most in nutrition and growth.

"The smaller the house the larger is the proportion of persons per room, (a) The proportion of children in one and two roomed houses exceeds the proportion of adults; (b) in the three-roomed houses the proportion of children to adults per room is equal; (c) and in houses of four or more apartments the proportion of adults exceeds that of the children per room. . . .

"While the laboring classes with a regular income distinctly over 20s. per week generally managed to secure a diet approaching the proper standard for active life; those with a smaller income, as well as those with an irregular income, failed to get a supply of food for the proper development of the body or for the maintenance of the capacity for active work."

Studies on growth.—II, On the probable nature of the substance promoting growth in young animals, C. FUNK and A. B. MACALLUM (*Jour. Biol. Chem., 23 (1915), No. 2, pp. 413–421, figs. 3*).—In continuation of previous work (E. S. R., 32, p. 360), feeding experiments with laboratory animals (rats) are reported.

Casein, sugar, starch, agar, a salt mixture, and either ordinary or purified butter constituted the basal ration. When fed with this diet alone the animals

died after 5 to 7 weeks, and similar experiments with pigeons indicated that the diet contained an insufficient quantity of vitamins, which prevent beri-beri.

The addition of from 2 to 6 per cent of dried brewer's yeast produced successful growth and maintenance.

In the authors' opinion, these experiments show that butter fat does not stimulate the growth of young animals. It is intended to study whether yeast alone without butter will produce normal growth in rats, and to isolate its efficacious constituents.

The resumption of growth after long-continued failure to grow, T. B. Osborne, L. B. Mendel, Edna L. Ferry, and A. J. Wakeman (*Jour. Biol. Chem., 23 (1915), No. 2, pp. 439–454, figs. 5*).—In the feeding experiments here reported, a number of laboratory animals (rats) received a diet either quantitatively or qualitatively insufficient for growth. This ration contained varying amounts of protein and amino acids, starch, lard, butter fat, and "protein-free milk."

The capacity to grow—the growth impulse—it was found was retained and exercised at periods far beyond the age at which growth ordinarily ceases. This was evident on supplying an adequate diet, resumption and completion of growth being obtained at an age of over 550 days, although growth usually ceases before the age of 300 days. The animals were able to reach their full size, and to exhibit normal procreative functions. Further details of the study are summarized in part as follows:

"The satisfactory resumption of growth can be attained not only after stunting by underfeeding but also after the cessation of growth which results when the diet contains proteins unsuitable for the synthetic processes of growth or is low in protein. Growth in the cases referred to is resumed at a rate normal for the size of the animal at the time. It need not be slow, and frequently it actually exceeds the usual progress.

"The size or age at which the inhibition of growth is effected does not alter the capacity to resume growth. Even when the suppression of growth is attempted for very long periods at a very small size (body weight) the restoration may be adequate when a suitable diet is furnished. . . .

"The period of growth may be greatly prolonged by inadequacies in the diet, so that growth becomes very slow without being completely inhibited. Though the time of reaching full size is thus greatly delayed, growth, as expressed by suitable body weight, can ultimately be completed even during the course of long-continued retardation."

On the basis of these observations the authors consider it reasonable to ask whether the capacity to grow can ever be lost unless it is exercised.

Diet and its effect upon blood sugar, W. von Moraczewski (*Biochem. Ztschr., 71 (1915), No. 4–5, pp. 268–288*).—The results are reported of an investigation to determine the influence of the ingestion of protein, fat, and carbohydrate and also the effect of muscular work upon the content of blood sugar in the human organism. The conclusions may be summarized in part as follows:

A diet containing an excessive amount of carbohydrate and deficient in other constituents increases the content of blood sugar temporarily, while one containing an excess of protein produces a slight, though permanent, increase. On the ingestion of an excessive amount of a well-proportioned diet the carbohydrate is without influence on the blood sugar, but the protein and fat have an insignificant though lasting effect. Tolerance for sugar seemed to be increased by muscular work.

Studies on blood fat.—I, Variations in the fat content of the blood under approximately normal conditions, W. R. Bloor (*Jour. Biol. Chem., 19 (1914), No. 1, pp. 1–24, figs. 5*).—The experiments reported are the first of a series

designed to study the fat content of blood in its possible relation to the metabolism of fat. The experimental procedure consisted in feeding fat, intravenous injection of various fat preparations, fasting for a short period, and narcosis.

It was found that feeding fat in the ordinary way caused an increase in the fat content of the blood, beginning in about one hour after feeding and reaching a maximum in about six hours. In the author's opinion the data indicate that "fat may be stored in two ways, (1) a temporary storage where the fat may be quickly but loosely stored and whose capacity is limited, and (2) the permanent fat deposits which take up fat slowly and release it slowly."

Studies on blood fat.—II, Fat absorption and the blood lipoids, W. R. Bloor (*Jour. Biol. Chem., 23 (1915), No. 1, pp. 317–326*).—Feeding experiments with laboratory animals (dogs) are reported which were conducted to determine the mechanism of fat absorption in its relation to the composition of the blood and as a preliminary step in the study of fat metabolism. At intervals after the animals received a feeding of fat, samples of the blood were analyzed for total fat, cholesterol, and lecithin. The data are discussed in comparison with the results obtained by other investigators, but no definite conclusions are drawn.

Text-book of physiological chemistry.—II, The function of the inorganic nutrients in cell metabolism.—Ferments.—Total metabolism, E. Abderhalden (*Lehrbuch der physiologischen Chemie.—II, Die anorganischen Nahrungsstoffe.—Die Bedeutung des zustandes der Bestandteile der zellen für ihre funktionen.—Fermente.—Gesamtstoffwechsel. Berlin and Vienna: Urban and Schwarzenberg, 1915, vol. 2, 3. ed., pp. VIII+1552, figs. 28*).—This part of the publication considers the mineral constituents of the diet and their relationship to life processes. The ferments and their relation to digestion and other life processes are also taken up at length and several chapters are devoted to a discussion of metabolism in its various aspects. The first part of the publication has been previously noted (E. S. R., 31, p. 361).

Carbohydrate indigestion, W. Tileston (*Jour. Amer. Med. Assoc., 65 (1915), No. 26, pp. 2214–2216*).—The author cites several clinical cases of carbohydrate indigestion which responded readily to a proper regulation of the diet. The symptoms are described as well as the dietary conditions usually associated with this disturbance.

Food poisoning by the Bacillus paratyphosus B—an epidemic due to the organism isolated from pie, H. S. Bernstein and E. S. Fish (*Jour. Amer. Med. Assoc., 66 (1916), No. 3, pp. 167–171*).—This article reports in detail the results of an investigation of an epidemic of food poisoning in which the number of cases was estimated at 60, of which 4 terminated fatally.

It was found that all of the persons attacked had eaten pie from the same bakery. Clinical investigation showed the disease to be the result of an infection of *Bacillus paratyphosus B*, and in the laboratory examinations of several samples of the pie this bacillus was isolated. References to a number of cases of food poisoning by *B. paratyphosus B* are given, and the authors emphasize the importance of protecting food supplies from infection by disease carriers.

ANIMAL PRODUCTION.

Modes of research in genetics, R. Pearl (*New York: The Macmillan Co., 1915, pp. VII+182, figs. 2*).—The chapters included in this book take up, respectively, a critical examination of current modes of research in genetics; biometric ideas and methods in biology, their significance and limitations; the nature of statistical knowledge; certain logical and mathematical aspects of the problem of inbreeding; and genetics and breeding.

Mendelism up to date (*Jour. Heredity, 7 (1916), No. 1, pp. 17–23, fig. 1*).—A review of the book entitled The Mechanism of Mendelian Heredity, by Morgan et al. (E. S. R., 33, p. 869).

Some experiments in mass selection, W. E. CASTLE (*Amer. Nat., 49 (1915), No. 588, pp. 713–726, fig. 1*).—The author comments on the results of Pearl's investigations with poultry (E. S. R., 34, p. 74), and takes exception to the statement that selection can change a population but not a character.

Fecundity in the domestic fowl and the selection problem, R. PEARL (*Amer. Nat., 50 (1916), No. 590, pp. 89–105*).—The author answers the criticisms made by Castle (see above), and sets forth his reasons for holding the opinions he does in regard to some phases of the selection problem.

Further data on the measurement of inbreeding, R. PEARL (*Maine Sta. Bul. 243 (1915), pp. 225–248, figs. 6*).—This is a continuation of material previously reported (E. S. R., 30, p. 66) in which the theoretical consequences of continued mating of first cousins and continued inbreeding of individuals exhibiting the avuncular type of relationship, that is, uncle × niece or nephew × aunt, is considered. It is shown that all types of cousin and avuncular matings if continued lead to values of the coefficient of inbreeding approaching 100 per cent. Relationship coefficients and the method of calculating them are described and illustrated by references to pedigrees of certain Jersey bulls and their progeny.

Heredity and sex (*Jour. Heredity, 7 (1916), No. 1, pp. 9–11*).—It is stated that the results of inbreeding experiments by Helen D. King at the Wistar Institute, Philadelphia, Pa., in which more than 22,000 albino rats have been bred and studied, indicate that disproportionate sex ratios are due to inheritance, it being found possible to alter considerably the normal ratio by a proper method of breeding.

Sex in live-stock breeding, E. N. WENTWORTH (*Jour. Heredity, 7 (1916), No. 1, pp. 29–32*).—Examples of inheritance of characters as affected by sex are given, but the author concludes that this phase of heredity does not offer great possibilities to the practical breeder at the present time.

Two pheasant crosses, J. C. PHILLIPS (*Jour. Heredity, 7 (1916), No. 1, pp. 12–16, figs. 3*).—In crossbreeding experiments with pheasants it was found that reciprocal matings gave widely different results in female and identical results in male offspring. The females proved practically sexless. The possibility of sex linkage is given as an explanation of these phenomena.

The gain, maintenance, and condition of germ-free animals and their significance in a study of the natural life processes, KÜSTER (*Arb. K. Gsndhtsamt., 48 (1914), No. 1, pp. 1–19, figs. 16*).—This article treats of the organisms found in the digestive tract of animals and of the effect of feeding sterilized feeds under germ-free conditions upon the general health and condition of such animals. A bibliography of literature cited is appended.

The reliability of weight averages for live animals, B. TACKE (*Jahrb. Weidew. u. Futterbaues, 2 (1914), pp. 36–49*).—Data are presented which demonstrate that the averages of three successive days' weighings of cattle are more reliable than single days' weighings, which often show an unaccountably large variation.

Development of limbs in ox and pig, N. SUSCHKINA-POPOWA (*Bul. Soc. Imp. Nat. Moscou. n. ser., 28 (1914), pp. 209–278, pls. 2; abs. in Jour. Roy. Micros. Soc., No. 6 (1915), pp. 559–561*).—The author has studied the development of the extremities of Bos and Sus and has compared the ontogeny with what can be inferred from the paleontological series in regard to the phylogeny.

Practical value of the Abderhalden dialysis method of determining the gestation of horses and cattle, RAUTMANN (*Landw. Wchnschr. Sachsen, 17 (1915), No. 33, pp. 291–293*).—The Abderhalden dialysis method of determining the gestation of animals is described. It is stated that its results are quite accurate if sufficient care is taken in making the test.

Production and improvement of animals, P. DIFFLOTH (*Zootechnie Générale.—Production et Amélioration du Bétail. Paris: J. B. Baillière & Son, 1915, pp. 476, figs. 147*).—This book treats of the breeding, feeding, care, and management of farm animals, and of various problems of heredity and related subjects.

Animal production in Argentina, J. A. RICHELET (*Bol. Min. Agr.* [*Buenos Aires*], *19 (1915), No. 8–9, pp. 655–675*).—An account of the development of the animal industry in the southern portions of Argentina, and of the exports of meat products and the imports of pure-bred animals from Europe and the United States.

Feeds and feeding manual, E. S. SAVAGE (*Madison, Wis.: The Henry-Morrison Co., 1915, pp. 96*).—This manual is designed for the use of the student in collecting data and in making a systematic study of feeds and rations.

Grain millet as a feedstuff, J. HANSEN ET AL. (*Arb. Deut. Landw. Gesell., No. 264 (1914), pp. 151*).—A review of a number of experiments in feeding grain millet to farm animals.

It is concluded that this feed is especially good for fattening cattle, sheep, and swine, comparing favorably with barley and corn. When fed to dairy cows at the rate of 3 kg. per day per 1,000 kg. of live weight, the millet proved to be a very desirable feed, but when fed in larger amounts it caused a depression in the milk yields and butter-fat content.

Feeding potato foliage as hay and as silage, W. VÖLTZ (*Ztschr. Landw. Kammer Braunschweig, 84 (1915), No. 20, pp. 167, 168*).—The composition of potato foliage hay is given as dry matter 85.7, organic matter 72.7, protein 11.8, fat 2.8, nitrogen-free extract 35.1, fiber 23, and ash 13 per cent. Both as hay and as silage, potato foliage has proved a very desirable feed for all classes of stock.

Silos and silage, A. STUTZER (*Landw. Hefte, No. 26 (1915), pp. 40, figs. 12*).—Descriptions are given of various types of German silos, together with a discussion of methods of ensiling the various fodder crops.

Stack ensilage (*Queensland Agr. Jour., n. ser., 5 (1916), No. 1, pp. 8–11, figs. 3*).—Methods of stacking silage are described.

The use of straw for fodder (*Bd. Agr. and Fisheries* [*London*], *Spec. Leaflet 47 (1915), pp. 7*).—Data as to the composition and digestibility of wheat, barley, oats, rye, bean, and pea straws are given, and rations in which straw forms a part of the roughage are suggested.

Oil seeds and feeding cakes (*London: John Murray, 1915, pp. XXV+112*).—This book, with a preface by W. R. Dunstan, treats of the composition, nutritive value, and uses of copra, palm kernels, peanuts, sesame seed, and mowrah seed.

The feeding of sugar-containing feedstuffs, MORGEN (*Württemb. Wchnbl. Landw., No. 24 (1915), pp. 382, 383*).—Due to the low protein content of sugar-containing feeds, such as sugar, molasses, and turf molasses, it is necessary to supplement these material with such feeds as sesame cake, meat meal, fish meal, or dried yeast when feeding to farm animals. It is suggested that from 5 to 10 kg. of sugar and 4 to 5 kg. of molasses per 1,000 kg. of live weight may be fed daily to swine, from 3 to 6 kg. of sugar and 2 to 4 kg. of

molasses to fattening cattle, from 2 to 5 kg. of sugar and 2 to 3 kg. of molasses to horses, from 2 to 3 kg. of sugar and 2 to 3 kg. of molasses to milch cows, and from 0.5 to 1 kg. of sugar and 0.5 to 1 kg. of molasses to young cattle.

Sugar and molasses feeds, GERLACH (*Bl. Zuckerrübenbau, 22 (1915), No. 12, pp. 137–140*).—Methods of feeding sugar and molasses to various classes of farm stock are described.

Commercial feeding stuffs, edited and compiled by R. E. STALLINGS (*Mo. Bul. Ga. Dept. Agr., 2 (1915), No. 7, pp. 96, fig. 1*).—Analyses are given of middlings, shorts, wheat bran, shipstuff, rice bran, molasses feed, alfalfa meal, dried beet pulp, cotton-seed meal, and hominy meal.

Feedstuff analyses, H. B. McDONNELL ET AL. (*Md. Agr. Col. Quart., No. 70 (1915), pp. 15*).—Analyses are given of linseed oil meal, gluten feed, dried beet pulp, dried brewers' grains, distillers dried grains, cotton-seed meal, beef scrap, meat meal, tankage, and various mixed and proprietary feeds.

Result of official chemists' analyses of feedstuffs (*Off. Bul. Ohio Agr. Com., 6 (1915), No. 2, pp. 103–110*).—Analyses are given of gluten feed, linseed oil meal, middlings, cotton-seed meal, hominy feed, oil meal, dried beet pulp, dried brewers' grains, tankage, and a proprietary feed.

Report on feeding experiment with palm kernel cake, 1915, J. HENDRICK and W. J. PROFEIT (*North of Scot. Col. Agr. Bul. 20 (1915), pp. 10*).—In feeding experiments with three lots of 10 cattle each it was found that, when fed in the same quantities, palm kernel cake may be expected to give equally as good a return in live weight increase as linseed cake or decorticated cotton cake, and at present prices in Great Britain it gives a better monetary return than either of these. When fed in a mixture with locust bean meal it is taken readily by stock.

Study of Philippine carabao, G. EVARISTO (*Philippine Agr. and Forester, 4 (1915), No. 7, pp. 123–141*).—This treats of the origin, development, and management of carabao and of their adaptability to Philippine conditions.

New Zealand sheep farming.—Wool, mutton, pastures, J. R. MACDONALD (*Auckland, New Zeal.: Pastoral Publishing Co., 1915, pp. XVII+123, figs. 16*).—This book treats of the principal breeds of sheep in New Zealand, their breeding, feeding, care, and management.

Pure-bred sheep in New Zealand, J. LINTON (*Jour. Agr. [New Zeal.], 11 (1915), No. 5, pp. 400–402*).—A general account of the number and distribution of the different breeds of sheep in New Zealand.

Corriedale sheep, F. R. MARSHALL (*Jour. Heredity, 7 (1916), No. 2, pp. 88–95, figs. 5*).—An account of the origin and development of this breed of sheep in New Zealand which, although it is a crossbreed of the Merino and Lincoln or Cotswold breeds, is remarkably true to type with very little tendency to reversion. It appears that this uniformity of type has resulted from a policy of vigorous selection pursued by New Zealand breeders. However, now that the breed is established such vigorous culling is not necessary. There has been an apparent blending of the opposed characters of the Lincoln and Merino stock, which is now uniformly transmitted.

It is stated that in the several hundred Corriedales examined none had wool as short as the longest wooled Merinos, as coarse as the Lincolns, or as fine as the Merino. The horned character still crops out quite frequently.

Systematic crossbreeding of dual-purpose range sheep, W. T. RITCH (*Amer. Sheep Breeder and Wool Grower, 35 (1915), No. 12, pp. 546–548, figs. 7*).—The author describes graphically a method for crossbreeding dual-purpose range sheep.

Pastures and sheds in connection with range lambing ground, J. T. JARDINE (*Nat. Wool Grower, 5 (1915), No. 3, pp. 17–21, fig. 1*).—In continuation

of work previously noted (E. S. R., 23, p. 575), it has been found that a 7 per cent difference in lamb crop in favor of pasture and shed management may be secured over the old method of open range.

Lamb feeding experiments, H. J. GRAMLICH (*Nebraska Sta. Bul. 153* (*1915*), *pp. 5–26*).—Five lots of 50 Western lambs each were fed 65 days with the results shown in the following table:

Summary of lamb-feeding experiments.

Kind of ration.	Average daily gain per head.	Feed consumed per pound of gain.			Cost per pound of of gain.	Average cost of feed per head.	Average profit per head.
		Grain.	Alfalfa.	Silage.			
	Lbs.	*Lbs.*	*Lbs.*	*Lbs.*	*Cts.*		
Ground corn, ground alfalfa, silage	0.371	4.01	1.61	1.96	5.81	$1.40	$0.88
Ground corn, ground alfalfa	.371	4.23	2.27	....	6.12	1.48	.80
Shelled corn, good alfalfa	.393	3.67	2.38	....	5.11	1.31	1.10
Shelled corn, good alfalfa, silage	.398	3.66	2.05	1.21	5.15	1.33	1.10
Shelled corn, poor alfalfa	.358	4.11	2.52	....	5.28	1.23	.98

A table showing the cost per 100 pounds of gain with corn and alfalfa hay at varying prices is given. "With corn high and alfalfa cheap, the cheapest gains can undoubtedly be made by feeding a medium corn ration and heavy feed of alfalfa." The net profit realized on the 250 lambs was $214.99.

Four lots of 7 native lambs each were fed 59 days, lot 1 receiving corn and alfalfa hay, lot 2 corn, alfalfa hay, and corn silage, lot 3 ground corn and ground alfalfa, and lot 4 corn, oil meal, and prairie hay. They made average daily gains per head of 0.632, 0.523, 0.486, and 0.496 lb., costing 4.48, 5.56, 6.24, and 6.96 cts. per pound of gain, for the respective lots. Lot 1 required 3.48 lbs. of corn and 1.52 lbs. of alfalfa, lot 2, 4.09 lbs. of corn, 1.96 lbs. of alfalfa, and 1.18 lbs. of silage, lot 3, 4.25 lbs. of corn and 2.42 lbs. of alfalfa, and lot 4, 3.58 lbs. of corn, 1.13 lbs. of prairie hay, and 2.04 lbs. of oil meal per pound of gain.

Two lots of lambs, lot 1 being western lambs fed in the open lot, and lot 2 native lambs shed-fed, both lots receiving shelled corn and alfalfa hay, made average daily gains per head of 0.393 and 0.632 lb., consuming 3.67 lbs. of corn and 2.38 lbs. of alfalfa, and 3.48 lbs. of corn and 1.52 lbs. of alfalfa per pound of gain, and costing 5.11 and 4.48 cts. per pound of gain for the respective lots.

In a similar comparison, except that shelled corn, alfalfa, and silage were fed, the lambs made average daily gains per head of 0.398 and 0.523 lb., consuming 3.66 lbs. of corn, 2.05 lbs. of alfalfa, and 1.21 lbs. of silage, and 4.09 lbs. of corn, 1.96 lbs. of alfalfa, and 1.18 lbs. of silage, per pound of gain, and costing 5.15 and 5.56 cts. per pound of gain for the respective lots. When the feeds were ground corn and ground alfalfa, the lambs made average daily gains per head of 0.371 and 0.486 lb., consuming 4.23 lbs. of corn and 2.27 lbs. of alfalfa, and 4.25 lbs. of corn and 2.42 lbs. of alfalfa per pound of gain, and costing 6.12 and 6.24 cts. per pound of gain for the respective lots.

Substitutes for corn in winter rations for fattening swine, B. E. CARMICHAEL (*Mo. Bul. Ohio Sta., 1* (*1916*), *No. 1, pp. 3–9, figs. 10*).—A popular discussion of results previously noted (E. S. R., 21, p. 173; 31, p. 868).

Malnutrition in hogs, D. J. HEALY and E. J. GOTT (*Kentucky Sta. Circ. 4* (*1915*), *pp. 3–7, figs. 2*).—An account of a feeding trial with 10 pigs infested with worms and suffering from malnutrition, which by proper care and feed were brought around to a thrifty condition in 54 days and made to bring a profit of $7.88 over the cost of feed, medicine, and care.

On the ergot of Equidæ, S. Yoschida (*Jour. Col. Agr. Tohoku Imp. Univ., 6 (1915), No. 8, pp. 171–190, pls. 2*).—The author presents evidence tending to show that the callosity and ergot which present Equidæ bear are not rudimentary pads, as claimed by some, but are rudimentary digits.

The cost of horse labor, F. R. Taylor (*Breeder's Gaz., 68 (1915), No. 15, p. 609*).—Data are given showing three years' records of all items, such as feed, labor, pasturage, and incidentals, including shoeing and veterinary services, that go to make up the cost of horse labor. The cost per hour of labor was estimated to be 10.83, 13.05, and 13.67 cts. for the respective three years.

Causes of sterility in the mule, J. E. Wodsedalek (*Biol. Bul. Mar. Biol. Lab. Woods Hole, 30 (1916), No. 1, pp. 1–56, figs. 52*).—This article reports an extensive study made in the zoological laboratories of the University of Idaho.

The mule partakes of the qualities of both the sire and the dam, but appears to resemble the ass more than the horse both in structure and habits. It was found that the greatest difference seems to lie in the relative number of chromosomes in the cells of these two animals. "The horse has 37 and the mule 51. This suggests that the number in the ass is about 65, thus making a difference of 28 chromosomes between the parents of the hybrid. The seminiferous tubules of the mule contain a much smaller amount of germ cells than do the tubules of the horse. Some of the tubules of the mule are entirely devoid of sex cells. The sex cells of the mule are larger than those of the horse in the corresponding stages. All of the 51 chromosomes in the spermatogonial cells of the mule enter the spindle for division. The mitotic figures are normal and there are no straggling chromosomes. The accessory chromosome of the hybrid, which is undoubtedly maternal in origin, resembles entirely the accessory of the horse, which fact shows that this sex-determining chromosome retains its individuality. The period of synizesis, which is so obvious in the primary spermatocytes of the horse, is lacking in the mule. The spireme of the horse is also lacking in the mule, but is replaced by a continuous network of chromatin threads, parts of which sometimes resemble the spireme to a certain extent.

"There is no definite time for the pairing of threads or chromosomes in the hybrid; the synaptic period begins at the time the chromatin threads make their appearance and continues through the prophase. The pairing of chromosomes, or pseudoreduction, is always incomplete and very inconstant. The number of chromosomes in the late prophase of the primary spermatocytes varies from 34 to 49. The greatest majority of counts of chromosomes lie between 40 and 45. The expected number, if reduction was complete, would be 25 besides the unpaired accessory. In the late prophase of the primary spermatocytes the bivalent chromosomes can as a rule be readily distinguished from the univalent ones. The number of chromosomes which the various cells lack in order to make the original total of 51, in terms of univalence, can usually be accounted for by the proportional increase in the presence of bivalents in such cells. Up to the early prophase of the primary spermatocytes there seems to be no necessity for the paternal and maternal chromosomes to cooperate in functioning. Each group seems to go on performing its functions normally. The real conflict ensues during the various stages of the primary spermatocyte, and is no doubt occasioned by the necessity for cooperation on the part of the paternal and maternal chromosomes in the process of conjugation or pseudoreduction.

"Abnormalities in mitosis occur invariably in primary spermatocytes that attain the metaphase stage. Giant cells are occasionally seen. The chromatoid body, which is very conspicuous and constant in the horse, is entirely lacking

in the mule. There is considerable evidence that primary spermatocytes make an attempt to eliminate some of the chromatin material. The chromosomes expelled by the cells appear to be those which were contributed by the mother of the hybrid. Destruction as well as abnormalities in mitosis seems to be restricted to the primary spermatocytes. Most of the cells disintegrate during the prophase, especially during the period of synapsis. Others meet their fate in the metaphase or early anaphase stages. The remaining few that survive the anaphase succumb soon after, and no secondary spermatocytes nor spermatids, and consequently no spermatozoa, are formed and the hybrid remains sterile. There are no authentic cases on record showing that fertility ever occurs in this hybrid."

A bibliography is appended.

The coloring of hens' eggs by crossbreeding and the duration of these color changes, A. von Tschermak (*Biol. Centbl., 35 (1915), No. 1, pp. 46–63, figs. 3*).—The author reports cases of color xenia and telegony in hens' eggs and comments on the causes of these phenomena.

Production and composition of the eggs of different breeds of poultry, P. F. Levêque and L. J. Ponscarme (*Ann. École Nat. Agr. Grignon, 4 (1913), pp. 38–42*).—Data are given showing the number, weight, and composition of the eggs of different breeds of poultry, and the influence of the shape of the egg on the amount of yolk, white, and shell.

It appears that generally there is more yolk and shell in the long egg but less white than in the round egg. On the average the desiccated egg contents contained 2.949 per cent of P_2O_5, of which the yolk contained 2.618 per cent; 18.443 per cent of nitrogen, of which the yolk contained 5.028 per cent; and 0.0953 per cent of Fe_2O_3, of which the yolk contained 0.0627 per cent.

Cost of raising Leghorn pullets, A. G. Philips (*Jour. Amer. Assoc. Instr. and Invest. Poultry Husb., 2 (1916), No. 5, pp. 39, 40*).—Experiments at the Indiana Experiment Station are referred to which indicate that it costs an average of 38.9 cts. to produce a pullet to laying age, including practically all expenses. The results also indicate that it takes from 4 to 5 eggs to produce a pullet.

Poultry raising in Colorado, W. E. Vaplon (*Colorado Sta. Bul. 213 (1915), pp. 15, figs. 6*).—A general discussion of methods of feeding, care, and management of poultry under Colorado conditions.

Methods of poultry management at the Maine Agricultural Experiment Station, R. Pearl (*Maine Sta. Doc. 515 (1916), pp. 98, figs. 27*).—This is an enlargement and revision of Farmers' Bulletin 357 (E. S. R., 21, p. 274), containing additional data on poultry hygiene and sanitation, brooders, feeding the laying pullets, natural enemies of poultry, use of hen manure, etc.

Duck raising, A. R. Lee (*U. S. Dept. Agr., Farmers' Bul. 697 (1915), pp. 22, figs. 13*).—This treats of the various breeds of ducks and their feed, care, management, and preparation for market.

Ancestry of the goose (*Jour. Heredity, 7 (1916), No. 1, pp. 39–45, figs. 4*).—The author contends that the ordinary domestic breeds of geese are descendants with slight modifications of the graylag goose, still found wild in most parts of the Old World. It is thought that breeding in captivity must have begun at an early date.

Pheasant farming, G. M. Simpson (*Oregon Fish and Game Com. Bul. 2 (1914), pp. 50, pl. 1, figs. 27*).—This booklet treats of the varieties of pheasants and their breeding, care, and management for commercial purposes.

Fish ponds on farms, R. S. Johnson and M. F. Stapleton (*U. S. Dept. Com., Bur. Fisheries Doc. 826 (1915), pp. 28, pls. 19*).—This treats of the utilization

of waste lands for fish ponds, the construction of ponds, the species of fishes suitable for pond culture, and the methods of care and management incident to fish propagation.

Fur buyers' guide, A. R. Harding (*Columbus, Ohio: Author, 1915, pp. 366, figs. 65*).—General directions are given for preparing, grading, buying, and selling raw furs.

Record of proceedings of annual meeting [of the American Society of Animal Production, November, 1914] (*Amer. Soc. Anim. Prod. Proc. 1914, pp. 129, figs. 10*).—This report contains papers, abstracts, etc., of the meeting previously noted (E. S. R., 32, p. 98):

DAIRY FARMING—DAIRYING.

Influence of feeding stuffs on the quality of milk and butter (*Mark Lane Express, 114 (1915), No. 4396, p. 715*).—A discussion of the feeding value and influence on the quality of milk and butter of grass, hay, clover, sainfoin, lucern, vetch, pea forage, lupine forage, white mustard, buckwheat, mangolds, swedes, carrots, rye, barley, crushed oats, maize, pulse grains, bean meal, linseed cake and meal, rape cake, poppy-seed cake, sunflower-seed cake, maize germ, palm-nut cake, coconut cake, peanut cake, decorticated and undecorticated cotton-seed cake, soy-bean cake, rice meal, niger-seed cake, madia cakes, and sesame-seed cake.

Diuresis and milk flow, H. Steenbock (*U. S. Dept. Agr., Jour. Agr. Research, 5 (1915), No. 13, pp. 561–568*).—In experiments with two goats at the Wisconsin Station it was found that "urea administered in a diuretic dose is able to decrease temporarily the flow of milk. Upon repeated administration the increased intake of water which follows the impoverishment of the tissues with respect to water content balances the draft for water imposed by the diuretic, and the milk secretion comes back to normal. Sodium chlorid with its diuretic action as well as its laxative effect is unable to depress milk secretion under normal conditions, as it simultaneously calls forth an excessive thirst, which increases the water intake. With the decreased flow of milk caused by a diuretic the percentage of solids is increased. Fat here is the principal variable. The mammary gland shows no tendency to absorb and subsequently put out in its secretion additional urea absorbed by the circulation. It is difficult to interpret the results sometimes obtained with alfalfa hay [E. S. R., 32, p. 74] as due to diuresis alone if urea diuresis can be taken as a type."

The influence of temperature and food upon the physical condition of the fat globules of milk, W. van Dam (*Landw. Vers. Stat., 86 (1915), No. 5–6, pp. 393–443, fig. 1; Molk. Ztg. Berlin, 25 (1915), Nos. 25, pp. 193, 194; 26, pp. 201, 202; abs. in Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases, 6 (1915), No. 10, pp. 1389, 1390*).—The author summarizes the results of his studies as follows:

"Fat globules which have been solidified through cooling below 0° C. undergo a change in volume as soon as they are subjected to a higher temperature. This change in volume attains its maximum between 10 and 20° and is much less in a temperature below 10°. The changes in volume due to the cooling of the fat globules take place very rapidly at first and afterwards more slowly. The equilibrium in volume corresponding to the reduced temperature is only reached after some weeks or even months. After having been cooled for 21 hours at a temperature of 0°, followed by warming, the equilibrium is only attained with any rapidity at a temperature of about 11°.

"By keeping the cream for 21 hours at a temperature of 16°, it was found that the globules remained liquid; on keeping it at 13° part was half solidified.

and when the temperature was maintained at 11° all the fat globules of the cream were half solidified. When the cows were kept in their sheds somewhat higher figures were obtained. It is possible in certain cases (e. g., by feeding beets to the cows) to obtain solidification even at a temperature of from 18 to 20°. As a rule, the critical temperature for the change in the state of the fat globules is to be found between 12 and 16°.

"In cream in which the volume of the fat globules was in normal relationship with the temperature at the beginning of churning, no solidification of the globules was produced during the process of churning. This has been proved a number of times. After a preliminary cooling for 21 hours at a temperature of 11° it is possible to find a slight continuation of the solidification of the globules during churning. This, however, was more noticeable than when the cream was cooled to 13°; in the case of cooling to 16° the continuation of solidification was still less perceptible. It may be concluded from this that fatty matter kept at a temperature favorable to acidification undergoes very little change in volume. The prevailing opinion that most of the globules become solidified during churning is, therefore, in nowise confirmed.

"Before churning, it is necessary to try and solidify the fat globules as much as possible, for cream containing solidified fat globules can be churned at a higher temperature. In this way it is possible to avoid all trouble caused by changes in the condition of the fat globules during churning. The degree to which the temperature is reduced has a more marked effect upon the change in condition of the globules than the duration of the cooling. Thus it has been found that after a preliminary cooling for four hours at a temperature of from 6° to 8° solidification was more rapid than after a 21 hours' treatment at 11°. Cooling to a low temperature (6°) is especially to be recommended in autumn.

"These results explain the success obtained with the density method of Swartz. If cream with a uniform content of fatty matter, but from different cows, is cooled for 21 hours at a temperature of 12° a varying amount of dilatation is observed in the fat globules when the cream is subsequently heated. The maximum dilatations were 188 units, the minimum 125 units, in 10,000 units of volume. The nature of the cow's feed has a considerable effect upon the dilatation of the fat globules, as many experiments have proved. In the same way, any change in the animal's mode of life such as the descent from the alpine pastures to their winter quarters, or vice versa, is also clearly demonstrated by the dilatometer.

"The iodin value of the fat globules is in direct relationship with the solidifying power, which shows that combinations of oleic acid have a preponderant effect on solidification. There are, however, some exceptions in cases where the iodin value is very small and where consequently there is very little dilatation. A cream containing globules which only dilated to a small extent gave in many experiments a soft butter, whereas in cases where the dilatation was considerable the butter produced was hard. In every case where the iodin value corresponded imperfectly to the dilatation, this latter corresponded better to the consistency of the butter."

Inexpensive appliances and utensils for the dairy, W. D. NICHOLLS (*Kentucky Sta. Circ. 6 (1915), pp. 15–31, figs. 9*).—This circular describes various kinds of inexpensive homemade steam sterilizers and a new-style sanitary milk pail.

Laboratory guide in market milk, H. E. ROSS (*Ithaca, N. Y.: Carpenter and Co., 1915, pp. 65, figs. 2*).—This book is designed for the use of students in dairy laboratories.

The present status of the pasteurization of milk, S. H. AYERS (*U. S. Dept. Agr. Bul. 342 (1916), pp. 16, fig. 1*).—This bulletin discusses the value of pas-

teurization and its extent in the United States, methods of pasteurization, cost of pasteurizing milk, and other related subjects.

Disinfection of milk by means of boiling and pasteurization at low pressure, L. K. Mordberg (*Trudy Selsk. Khoz. Bakt. Lab., 4 (1913), pp. 343–364, figs. 5*).—The author found in his experiments that the methods commonly in use for the sterilization of milk, viz, pasteurization and boiling, considerably alter the component parts of milk and can not be considered as entirely satisfactory. Sterilization of milk by boiling at low pressure (vacuum boiling) has certain disadvantages; but pasteurization in a steam vacuum apparatus (vacuum sterilization) is deemed worthy of note and may be recommended because the milk does not alter in appearance. Neither a second vacuum boiling nor a second vacuum pasteurization sterilizes the milk. It is necessary for the vacuum boiling of milk that the temperature of the vacuum apparatus be, during the entire duration of the experiment, somewhat higher than the boiling point of milk, and in vacuum pasteurization it should be about that point. In order to diminish evaporation in the milk and to eliminate other undesirable features, it is necessary that the milk be heated during vacuum boiling in superheated aqueous steam, while during vacuum pasteurization it should be heated in saturated steam.

Comparative experiments on pasteurizing and biorizing milk, R. Burri and A. C. Thaysen (*Ztschr. Gärungsphysiol., 5 (1915), No. 3, pp. 167–186, fig. 1*).—In these experiments the biorizator proved even more effective than the pasteurizer in reducing the germ content of the milk, and this without imparting a cooked flavor to the milk.

Pasteurization of milk supplies as a protection against typhoid fever, J. C. Geiger and F. L. Kelly (*Jour. Amer. Med. Assoc., 66 (1916), No. 4, pp. 263, 264, fig. 1*).—An account of a typhoid epidemic in California, evidence being presented to show that in one district where pasteurization was required there were no cases of typhoid fever traceable to the particular milk supply in question, while in the other district where the sale of raw milk was permitted the disease was very prevalent.

Cooling of cream to improve its quality, O. Erf (*Agr. Col. Ext. Bul. [Ohio State Univ.], 11 (1915), No. 1, pp. 11, figs. 8*).—Methods of cooling cream are described.

The Swedish "Rune" butter brand (*Nord. Mejeri Tidn., 30 (1915), No. 22, p. 258; abs. in N. Y. Produce Rev. and Amer. Cream., 40 (1915), No. 20, p. 815*).—It is said that the number of creameries entitled to the use of the "Rune" brand throughout 1914 was 382 as against 332 in 1913, while 81 creameries had the right for part of the year as against 130 in 1913. Only 67 creameries lost the right through the poor quality of their butter, while 14 lost it because, owing to various causes, they could not send butter to the tests every time. There were exported 41,752,856 lbs. of butter, of which 98.7 per cent was worthy of the Rune brand.

Manufacture of cheese, F. A. Silva Barrios (*Min. Agr. Nac. [Buenos Aires], Dir. Gen. Enseñanza e Invest. Agr. [Pub.], No. 39 (1915), pp. 46, figs. 10*).—Methods of making several varieties of South American cheeses are described.

Price and nutritive value of various cheap Königsberg cheese varieties, A. Friedmann and B. Magarschak (*Ztschr. Hyg. u. Infectionskrank., 80 (1915), No. 3, pp. 399–403*).—Analyses are given of 15 varieties of cheese.

The technological chemistry of the manufacture of "Grana" cheese in Reggio, G. Fascetti (*Staz. Sper. Agr. Ital., 47 (1914), No. 8, pp. 541–568; abs. in Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases, 6 (1915), No. 1, pp. 142–145*).—The author summarizes theories advanced on the

means of manufacturing and ripening cheeses, and maintains that real technical study has been almost entirely neglected.

He has observed that the acidity of milk on being drawn varies considerably (from 7 to 9.6 per cent) among cows under identical conditions. After 20 hours at 10° C. the acidity fell from 8 to 7.2 per cent and from 9.6 to 9. This decrease is still further accentuated (an average of 0.9 per cent) by moderately warming the milk during several minutes immediately after drawing. The addition of lactic acid to the milk raises the acidity in almost direct numerical relation to the quantity added, and there is nothing to prevent the same effect from the acidity due to fermentation. The author defines the acidity of fermentation as the acidity due to the lactic fermentation and added to the natural acidity. The difference between the acidity of the milk and that of the serum after the coagulation of the casein is practically constant. The diminution is, therefore, due almost entirely to the removal of the casein.

He has obtained experimental confirmation of the technical principle that the duration of manufacture of Grana cheese is in almost inverse relation to the degree of ripening of the milk. Thus, whilst a milk of Soxhlet acidity 3.8 coagulates in 30 minutes at 38° and the time of working the Parmesan obtained is 180 minutes, the same milk coagulates in 18 minutes when one adds (to the quantity necessary to give a cheese) 80 gm. of pure lactic acid, and the period of working is reduced to 60 minutes.

The addition of 1.5 cc. of normal lactic acid to 120 cc. of fresh milk and submitting it to the process of making Parmesan, together with an equal sample to which no lactic acid had been added, showed that the lactic acid favored a greater expulsion of the serum from the coagulum (which contained 48 per cent of water against 55.83) and removed from the coagulum about 2 per cent more of mineral matter (5.3 against 7.23 per cent), represented by phosphate of lime which passed into the serum as soluble phosphate and lactate of lime. The serum contained in the coagulum before scalding increased the percentage of ash (1.91 per cent in the dry coagulum against 1.3 per cent in the same coagulum after washing), but at the end of scalding there was no sensible difference between the quantities of ash contained in the coagulum directly dried (2.43 per cent) and in the coagulum previously washed (2.41 per cent). This indicates that, at the end of the scalding, the granules of casein do not give up to the washing water the serum which they contain and form a homogeneous mass.

The addition to samples of 200 cc. each of the same milk of 10 cc. of distilled water or water containing, respectively, 1, 2, and 3 cc. of normal lactic acid before submission to the Parmesan process showed that the soluble compounds of lime and phosphoric acid increase with the degree of acidity of the serum, but the compounds of lime in a greater proportion than those of phosphoric acid. This indicated that a part of the lime which passes into solution in the serum belongs to a salt different from monocalcium phosphates, namely, lactate of lime. The plasticity acquired by the paracasein in proportion to its freedom from mineral constituents has been specially attributed to the presence of calcium lactate, but this was not confirmed by the author's experiments, according to which the elasticity of the paracasein is certainly bound up with the presence of an acid salt, probably monocalcium phosphate.

It was apparent that Emmental cheese is made under conditions of very low acidity of fermentation, while Grana cheese requires a certain amount of acidity, and Cheddar a much greater acidity. After manufacture, the casein granules should therefore possess very different chemical composition and

physical properties, which differences appear in the cheese and in the quality and intensity of the fermentations taking place within it.

Mongolian cheese called Naitofu, M. SATO (*Trans. Sapporo Nat. Hist. Soc., 6 (1915), No. 1, pp. 18–21*).—A method of making the Mongolian cheese, Naitofu, is described and its composition given.

The rennet supply for cheese making, D. CUDDIE (*Jour. Agr. [New Zeal.], 11 (1915), No. 6, pp. 477–481, figs. 2*).—Methods of preparing rennet from the stomachs of calves are described.

Rennet economy and substitutes, W. VAN DAM (*Verslag Ver. Exploit. Proefzuivelboerderij Hoorn, 1914, pp. 45–56; abs. in N. Y. Produce Rev. and Amer. Cream., 40 (1915), No. 20, p. 815*).—The author states that in making Edam cheese at the Hoorn Experiment Station with half the usual quantity of rennet and adding 40 cc. of 10 per cent muriatic acid to 100 liters to prevent a delayed coagulation, the result was normal and the cheese very good. Another experiment with only one-fourth the regular quantity of rennet and the addition of 40 gm. of water-free calcium chlorid for 100 liters of milk also gave normal results. The somewhat tender curd became dry enough in the same time as the control cheese and without raising the cooking temperature. The taste was even declared better. The use of one-third rennet was, however, recommended. Pepsin was also tried as a substitute and found to be satisfactory.

Saltpeter in making Swiss cheese, E. HAGLUND (*Meddel. Centralanst. Försöksv. Jordbruksområdet, No. 101 (1914), pp. 27–48; abs. in N. Y. Produce Rev. and Amer. Cream., 40 (1915), No. 20, p. 814*).—Investigations as to the ripening process in Swedish Emmental and large-eyed Swedish Estate cheese are reported.

It was found that the addition of saltpeter to the cheese milk reduces in both cheeses the content of volatile fatty acids, the propionic acid being especially affected. Both cheeses easily become "close or blind" (having no eyes) on the use of saltpeter, and not infrequently get a more or less decided saltpeter taste and often are discolored. Nevertheless, the inclination of the cheeses to an abnormal and too violent fermentation may be counteracted by the addition of saltpeter.

The advantage of paraffining cheese, R. AF TROLLE (*Molk. Ztg. [Hildesheim], 29 (1915), No. 44, pp. 559, 560, fig. 1*).—Results of experiments are reported showing that the loss of weight of cheese stored for 100 days was materially reduced by paraffining. The ordinary loss during this period ranged from 10 to 13 per cent, while the paraffined cheese lost only from 0.8 to 3.6 per cent.

The yoghourt bacillus, F. DUCHÁČEK (*Biochem. Ztschr., 70 (1915), No. 3–4, pp. 269–293; abs. in Jour. Chem. Soc. [London], 108 (1915), No. 637, I, p. 1042*).—Tests were made of several strains of *Bacillus bulgaricus*, one strain coming from a commercial medicinal source and another which was recognized as the true *B. bulgaricus*.

The latter strain was found to be much more sensitive, but was readily killed by acids, and would only develop in certain culture media, which must contain sugars. The other strain was much less sensitive, and, in contrast to the true *B. bulgaricus*, readily digested proteins. Attention is directed to the difficulty of completely sterilizing milk, to the ease with which the true *B. bulgaricus* is destroyed, and to the great possibilities of this taking place in commercial preparations, and the predominance in these of other strains of bacteria which remain, owing to incomplete sterilization.

VETERINARY MEDICINE.

Tenth International Veterinary Congress.—Reports for the general meetings (*10. Internat. Vet. Cong., 1914, II, pp. 552, pls. 13, fig. 1*).—The papers presented before the general meetings of this congress, held at London in August, 1914, are presented as follows: Foot-and-mouth Disease, by L. Nevermann (pp. 3–38), by E. Leclainche (pp. 39–50), by H. Remmelts (pp. 51–90), by E. Hess (pp. 91–104), by A. E. Mettam (pp. 105–139), and by J. Rudovsky (pp. 140–157); The Relation of the So-called Types of Tubercle Bacilli, by A. Eber (pp. 161–180); Immunity in Tuberculosis and Vaccination of Cattle Against Tuberculosis, by H. Vallée (pp. 181–195); Tuberculosis, by J. M'Fadyean (pp. 196–222) (E. S. R., 33, p. 85); Tuberculosis, by G. Regnér (pp. 223–233); Tuberculosis and the So-called Types of Tubercle Bacilli, by D. A. de Jong (pp. 234–249); Measures to be Taken Against Breeding Cattle Reacting to Tuberculin from the Point of View of International Traffic, by D. A. de Jong (pp. 250–253); Contagious Abortion in Domesticated Animals, by Zwick (pp. 257–275); Epizootic Abortion, by G. Moussu (pp. 276–291); The Alterations in the Uterus in Epizootic Abortion and in Some Other Infectious Metrites in Cows, by S. Wall (pp. 292–342); Epizootic Abortion, by S. Stockman (pp. 343–358) (E. S. R., 33, p. 578); Public Control of the Production, Distribution, and Sale of Milk in the Interests of Public Health, by A. D. Melvin (pp. 361–385); Police Control of the Milk Supply, by von Ostertag (pp. 386–430); Public Control of the Production, Distribution, and Sale of Market Milk, by S. Nystedt (pp. 431–480); The Control of the Milk Supply, by J. W. Brittlebank (pp. 481–510); The Control of the Production, Distribution, and Sale of Milk in the Interest of Public Health, by C. Porcher (pp. 511–522); On the Opportunity of Installing an International Commission for the Control of Tuberculosis of Domestic Animals, by D. A. de Jong (pp. 523–532); and Uniform Instructions Relating to the Sea Transport of Domesticated Animals (pp. 533–552).

Tenth International Veterinary Congress.—Reports for the sectional meetings (*10. Internat. Vet. Cong., 1914, III, pp. VIII+999, figs. 18*).—The papers presented before the sectional meetings of this congress are as follows: Meat Poisoning, Its Pathogenesis and the Measures Necessary to Guard Againt It, by J. Bongert (pp. 5–19); Meat Poisoning, by H. Messner (pp. 20–45); Alimentary Intoxications: Pathogenicity and the Necessary Preventive Measures, by Guillaume (pp. 46–72); The Question of Tuberculous Meat, by E. Césari (pp. 75–113); General Principles Governing the Examination and Inspection of the Organs and Meat of Tuberculous Animals, by Nieberle (pp. 114–136); General Principles to be Observed in the Inspection of the Carcasses and Organs of Tuberculous Animals with a View to Determining Their Safety as Articles of Human Food, by H. Hansson (pp. 137–151); Johne's Disease (Enteritis Chronica Paratuberculosa Bovis), by O. Bang (pp. 157–190); Infectious Intestinal Catarrh of Cattle, by Miessner (pp. 191–201); Johne's Disease, by A. L. Sheather (pp. 202–218) (E. S. R., 33, p. 180); Piroplasmoses of European Cattle with Particular Reference to Their Etiology, by P. Knuṭh (pp. 221–245) (E. S. R., 34, p. 478), and by S. von Rátz (pp. 246–263); Filterable Viruses, by K. F. Meyer (pp. 267–293) (E. S. R., 32, p. 475); Ultramicroscopic Viruses, by Panisset (pp. 294–320); Diseases of Dogs, Etiology and Vaccination, by H. Carré (pp. 323–329); Anthrax, by W. H. Dalrymple (pp. 335–349), and by A. Lukács (pp. 350–366); Anthrax: Contribution to the Pathogenicity and Control, by J. Szpilman (pp. 367–404); Vaccination Against Hog Cholera, by F. Hutyra (pp. 407–421) (E. S. R., 33, p. 183); Hog Cholera in Germany, by K. Glässer

(pp. 422–451); Chronic Glanders in the Brood Mare, by De Roo (pp. 455–462); Glanders, by Drouin (pp. 463–480) and by J. Schnürer (pp. 481–495); Diagnosis of Glanders, by H. Miessner (pp. 496–514); Sarcoptic Mange of Equines, by A. Barrier (pp. 517–529); Sarcoptic Scabies of the Horse, by E. R. C. Butler (pp. 530–538); Sarcoptic Mange in the Horse, by T. Halski (pp. 539–551); Anesthetics in Veterinary Surgery, by F. Hendrickx (pp. 557–577); Respiratory Anesthesia of Animals, by L. A. Merillat (pp. 578–589); Local and General Narcosis, by J. Vennerholm (pp. 590–612); Anesthesia, Local and General, by G. H. Wooldridge (pp. 613–632); General and Local Anesthesia of Domestic Animals, by G. Udriski (pp. 633–653); Laminitis, by Liénaux (pp. 657–667); and by G. Joly (pp. 668–678); The Technique of the Operation for Roaring, by W. L. Williams and J. N. Frost (pp. 681–691); Roaring in Horses, by Fontaine (pp. 692–707); The Surgical Treatment of Roaring in Horses, by F. Hobday (pp. 708–716); New Researches About Roaring in Horses, by H. A. Vermeulen (pp. 717–724); General Considerations on the Use of Drugs Against Nematodes in the Digestive Tract, by A. van den Eeckhout (pp. 727–732); The Use of Medicaments in the Treatment of Diseases Caused by Nematodes, by A. Railliet (pp. 733–753), and by J. F. Craig (pp. 754–780) (E. S. R., 32, p. 578); Diseases Transmitted by Ticks, Their Classification, Treatment, and Prophylaxis, by J. Lignières (pp. 785–805); Diseases Transmitted by Ticks, Their Classification, Treatment, and Eradication, by A. Theiler, C. E. Gray, and W. M. Power (pp. 806–819) (E. S. R., 32, p. 380); The Cultivation of *Anaplasma marginale* in Vitro, by F. Veglia (pp. 820–824); Diseases Transmitted by Ticks, Their Classification, and Prophylaxis.—American Babesiases, by P. de F. Parreiras Horta (pp. 828–871); Diseases Transmitted by Ticks, by J. B. Piot Bey (pp. 872–878); Classification, Therapeutics, and Prophylaxis of Trypanosomiases, by Cazalbou (pp. 881–923); Trypanosomiasis, by R. E. Montgomery (pp. 924–949); The Diseases Transmissible by Flying Insects, Their Classification, Treatment, and Prophylactic Measures, by A. Lanfranchi (pp. 950–976); and The Influence of Heredity Upon the Premature Development of Those Defects which Lessen the Economic Value of Horses, and Their Symptoms, by E. Suckow (pp. 979–999).

[Veterinary work in foreign countries] (*Arb. K. Gsndhtsamt., 48 (1914), No. 2, pp. 165–284; 48 (1915), No. 4, pp. 461–594*).—A further discussion (E. S. R., 30, p. 476) of veterinary affairs in foreign countries: In France, by Wehrle (pp. 165–243); in British India and Ceylon, by Wehrle (pp. 244–284); in Bulgaria, by Poppe (pp. 461–486); and in Russia, by C. Maass (pp. 487–566). An account is also given by Titze (pp. 567–594) of the work in the United States.

The diseases of wild animals and their treatment, A. Olt and A. Ströse (*Die Wildkrankheiten und ihre Bekämpfung. Neudamm: J. Neumann, 1914, pp. XVI+633, pls. 10, figs. 179*).—The first part of this work (pp. 1–238) deals with the cause, nature, and means of preventing the diseases of wild animals; their food plants; application of remedial measures; protection; sanitary police measures; etc. In the second part (pp. 241–625) are taken up the diseases due to Protozoa, worms, and arthropods; infectious diseases; poisoning; etc.

On the worm parasites of tropical Queensland, W. Nicoll (*Rpt. Brit. Assoc. Adv. Sci., 1914, pp. 407–409*).—A brief report is given of a collection of the more common parasites, together with a brief account of experiments on the migration of Onchocerca larvæ through the capsule of the worm nodule. See also a previous note (E. S. R., 32, p. 377).

Colorado plants injurious to live stock, G. H. Glover and W. W. Robbins (*Colorado Sta. Bul. 211 (1915), pp. 3–71, figs. 91*).—This bulletin consists mainly of descriptions of these plants, prepared with a view to assisting stockmen

and farmers in the identification of poisonous plants, to offer suggestions relative to preventive and remedial measures, and to cite special conditions under which certain plants are known to poison animals.

The poisoning of live stock while feeding on plants of the sorghum group, C. K. FRANCIS (*Oklahoma Sta. Circ. 38 (1915), pp. 4*).—A popular account, based on the report previously noted (E. S. R., 30, p. 584), with additional analyses of Sudan grass.

A comparison of the sizes of the red cells of some vertebrates, J. B. CLELAND (*Rpt. Brit. Assoc. Adv. Sci., 1914, pp. 404, 405*).—A brief report of systematic measurements made of the erythrocytes of various Australian vertebrates.

The Abderhalden reaction, D. D. VAN SLYKE, MIRIAM VINOGRAD-VILLCHUR, and J. R. LOSEE (*Jour. Biol. Chem., 23 (1915), No. 1, pp. 377–406, figs. 4*).—"A simple and quantitative method has been established for measuring by amino nitrogen determination the extent of the proteolysis occurring when serum and substrate are incubated as in the Abderhalden reaction. The mixture after incubation is freed from protein with colloidal ferric hydrate, the filtrate evaporated, and the free amino nitrogen in it determined with the micro-amino apparatus. The increases in amino nitrogen observed when digestion occurs are many times greater than the experimental error of the method; so that it appears possible to rule out the latter as a factor in the results. . . .

"Practically every serum, whether from a pregnant or a nonpregnant individual, showed protein digestion when incubated with placenta tissue prepared according to Abderhalden."

Results from pregnant sera tended to average somewhat higher than those from nonpregnant. "The difference even in the averages is not great, however; and the individual variations of both pregnant and nonpregnant sera make the results from both overlap so completely as to render the reaction, even with quantitative technique, absolutely indecisive for either positive or negative diagnosis of pregnancy."

Carcinoma tissue was found to be digested to about the same extent as placental, which is further evidence of nonspecificity.

"It appears that nearly all human sera can digest certain coagulated tissue proteins to some extent, but that the source and significance of the proteolytic agents, and the influences that cause their fluctuation, remain as yet undetermined."

Contributions to the dialysis method of E. Abderhalden, F. PREGL (*Fermentforsch., 1 (1914), No. 1, pp. 7–12*).—The author recommends the use of collodion thimbles for the dialysis, and gives detailed directions for their preparation. A new procedure for the preparation of the placental substrate in which the lipoids are removed by alternate treatment with alcohol and ether is outlined. Certain precautions to be observed in the use of collodion dialyzers are also noted.

The anaphylactic reaction with so-called proteoses of various seeds.—The biologic reactions of the vegetable proteins, VI, H. G. WELLS and T. B. OSBORNE (*Jour. Infect. Diseases, 17 (1915), No. 1, pp. 259–275*).—Continuing previous work (E. S. R., 31, p. 377) the principal conclusions drawn by the authors are as follows:

Those vegetable protein preparations commonly designated as "proteoses" are distinguishable by biological reactions and are, therefore, chemically distinct from the other proteins of the seeds, as was demonstrated by the anaphylactic reaction. "Proteoses" obtained from different seeds and grains are also quite distinct from one another. They exhibit strong anaphylactogenic proper-

ties, very small doses being fatal in many cases. Heating for one-half hour at 100° C. does not destroy their activity.

"In their anaphylactic power these 'natural proteoses' differ sharply from proteoses obtained from animal proteins by digestion with enzyms or by chemical hydrolysis, such artificial products being almost, if not entirely, nonanaphylactogenic. Furthermore, those products of hydrolysis which result from heating vegetable proteins with acids, with water under pressure, or by peptic digestion, have, so far as we have tested them, no anaphylactogenic properties. From these facts it would seem that the vegetable 'proteoses' belong to a group of proteins which are chemically different from any heretofore recognized. They resemble highly soluble native proteins in their anaphylactogenic capacity, and are probably quite as complex in their chemical constitution. Their designation as 'proteoses' is consequently improper.

"This differentiation of so many of these 'proteose' preparations from the other proteins in the same seed is a striking example of the fact that specificity of the anaphylaxis reaction is not dependent on biologic origin but on chemical constitution. . . .

"The results described in this paper demonstrate that anaphylaxis furnishes a useful means for determining the purity of protein preparations obtained from plant extracts, in so far as contamination with the other proteins of the same seed is concerned."

Inhibitory action of heterologous protein mixtures on anaphylaxis, J. H. LEWIS (*Jour. Infect. Diseases, 17 (1915), No. 1, pp. 241–258*).—Experimental data indicate that a protein which will produce a marked anaphylactic sensitization when injected alone into a guinea pig will fail to do so if injected together with, or 24 hours after, a much larger amount of another protein.

"These results may be explained by the conception that the number of receptors in the body that can unite with a foreign protein is limited. The inhibiting protein, if present in large amount, combines with all, or almost all, of these receptors. Hence, another protein injected with it, or after it, is prevented from being combined in sufficient amount to stimulate the active production of antibodies. And when a large amount of protein is injected with or after a sensitizing dose of immune serum, the combination of the latter with the cell receptors, which is necessary for passive sensitization, is prevented in the same way."

On the formation of specific proteolytic ferments in response to the parenteral introduction of foreign protein, A. E. TAYLOR and FLORENCE HULTON (*Jour. Biol. Chem., 22 (1915), No. 1, pp. 59–61*).—From experimental data, using the protamin salmin, it was demonstrated that the rabbit does not form a protective ferment in response to the injection of the particular protein used.

"This result does not prove that a protective ferment is not formed in response to the incorporation of placental protein. But it does indicate definitely that the dogmatic statement that the body responds with protective ferments to the injection of foreign proteins as a class reaction can not be maintained."

Results of the investigation of defensive ferments by the simultaneous application of different methods, E. ABDERHALDEN (*Fermentforsch., 1 (1914), No. 1, pp. 20–32, fig. 1*).—Experimental data of results obtained by the ninhydrin, microamino-nitrogen, and total nitrogen determinations in the dialyzate, optical, and interferometric methods are recorded. The results are not discussed in the present paper.

The "interferometric method" for the study of defensive ferments, P. HIRSCH (*Fermentforsch., 1 (1914), No. 1, pp. 33–46, pl. 1, figs. 7*).—The apparatus and procedure of the method are described in detail.

The investigation of defensive ferments by means of the Van Slyke micromethod for the determination of amino nitrogen, H. STRAUSS (*Fermentforsch., 1 (1914), No. 1, pp. 55–57*).—In a large number of sera examined according to the Abderhalden dialysis method a decided increase in the amount of amino nitrogen, as determined by the Van Slyke method (E. S. R., 31, p. 610), was obtained whenever there was a positive ninhydrin reaction. Experience in the manipulation of the Van Slyke apparatus is deemed necessary for concordant results. Possible sources of error and certain precautions necessary in the procedure are indicated. Experimental data show all positive results with pregnant sera.

The excretion of antigen, AGNES E. PORTER (*Biochem. Jour., 9 (1915), No. 1, pp. 1–8*).—From a series of experiments the author concludes that egg white introduced parenterally into a rabbit is excreted unchanged in chemical properties. Three variations, however, regarding its specificity are possible: "(1) It may retain partial properties as antigen, binding complement in the presence of antiegg serum, not causing precipitation but capable of exercising an influence over antibody so as to prevent it precipitating with fresh antigen; (2) it may be excreted in a nonspecific form completely indifferent as antigen; (3) it may retain full antigen properties.

"This variation in specificity of excreted albumin points to a physical rather than a chemical explanation of the precipitin reaction."

Detection and concentration of antigens by ultrafiltration, pressure dialysis, etc., with special reference to diphtheria and tetanus toxins, A. T. GLENNY and G. S. WALPOLE (*Biochem. Jour., 9 (1915), No. 2, pp. 298–308*).—The use of collodion-water membranes of a special type is suggested for the purpose of forming a first opinion as to the specificity of the toxic element of any cultural fluid. Mallein and tuberculin have been freed from glycerol and a large quantity of nitrogenous material by this process. The essential steps in a process for the concentration and purification of diphtheritic toxin, which at a yield of from 70 to 80 per cent diminishes the nitrogen content about 50 times, are dialysis under pressure, followed by acidification, centrifugalization, and re-solution of the small precipitate obtained in a trace of alkali. Ultrafiltration followed by pressure dialysis gives a concentration of tetanus toxin which should be of considerable practical value. The collodion membranes are impermeable to enzyms but allow secretin, the pituitary active principle, the coenzym of zymase, and the toxic constituent of Witte's "peptone" to pass through.

Experiments in vaccination against anthrax, A. EICHHORN (*U. S. Dept. Agr. Bul. 340 (1915), pp. 16*).—The prevalence of anthrax and methods of control, protective vaccination, and the production and standardization of the serum are first dealt with by the author. Experimental data on the hyperimmunization of horses and serum tests follow, together with a discussion of the preparation of spore vaccine, a description of the technique of administration, a test of the simultaneous method on cattle and sheep, field tests, the use of serum treatment of anthrax in man, and concentration of the serum. In field tests several hundred animals, including horses, mules, cattle, sheep, and hogs, were treated with the Bureau serum and vaccine on farms where the disease had broken out, without a loss.

"The use of the serum-alone treatment is indicated in cases where the infection has already occurred in a herd. Since the serum confers only a passive immunity, it is advisable to revaccinate the herd in from three to five weeks by the simultaneous method. The serum possesses great curative value. Depending on the severity of the infection, the curative dose is from 30 to 100 cc., the injection to be repeated if necessary.

"For the simultaneous treatment a spore vaccine, carefully standardized, is preferable to the ordinary Pasteur vaccine. Spore vaccine should be employed also in preference to the Pasteur vaccines for immunization with vaccine alone. This vaccine has a decided advantage over the Pasteur because of the possibility of more accurate dosing and because of its better keeping qualities.

"Experiments with concentrated serum and dry spore vaccine are very promising. This method would greatly simplify the vaccination process and also insure the product against subsequent contamination and deterioration."

The lesions in experimental infection with Bacterium tularense, P. G. Woolley (*Jour. Infect. Diseases, 17 (1915), No. 3, pp. 510–513*).—A detailed description is given of the typical lesions as they appeared in the different organs of laboratory animals that had been inoculated with *B. tularense*.

Experiences with Streptococcus and Staphylococcus vaccine, J. P. Isherwood (*Vet. Rec., 28 (1915), No. 1412, pp. 45, 46*).—The author reports upon three cases of strangles, a case of poll evil, and one of traumatism which were helped by the use of a Streptococcus and Staphylococcus vaccine.

Immunization with tetanus toxin-antitoxin mixtures, M. von Eisler and E. Löwenstein (*Centbl. Bakt.* [*etc.*], *1. Abt., Orig., 75 (1915), No. 4, pp. 348–364*).—The authors conclude that guinea pigs can be immunized by subcutaneous injections of neutralized or overneutralized tetanus toxin-antitoxin mixtures. For this purpose two injections were found to be necessary, no apparent immunity being established after the first injection. With rabbits one injection sufficed, in some cases, to cause a good production of antitoxin products, the neutral mixture being allowed to set one-half hour at room temperature before injection. With mixtures which stood from 6 to 16 hours before being used an appreciable quantity of antitoxin could not be produced in the rabbit by a single injection. In the guinea pig 12 days after the reinjection there was a marked production of antitoxin. In the rabbit the same result was obtained 13 days after the first injection and the maximum production reached in the third or fourth week.

Emulsions of the organs (brain, spinal cord, liver, spleen, and leucocytes) of the guinea pig were not found to bind toxin from a toxin-antitoxin mixture, at least in quantities too small to produce tetanus in mice. However, in the rabbit liver cells were found to bind toxin from such a mixture and to produce tetanus in mice and guinea pigs. The same result could be produced if kaolin which had been in contact with the neutralized mixture was injected. It seems, then, that the liver cells and kaolin cause a cleavage of the toxin-antitoxin mixture and withdraw the toxin from combination.

Studies of Chagas disease in Argentina and the trypanosome of the Vinchuca, C. Maggio and F. Rosenbusch (*Centbl. Bakt.* [*etc.*], *1. Abt., Orig., 77 (1915), No. 1, pp. 40–46, pls. 2; abs. in Trop. Vet. Bul. 3 (1915), No. 4, p. 124*).—Although the authors have not actually detected a case of Chagas disease in Argentina, they have found large numbers of flagellates, similar to those described by Chagas as *Schizotrypanum cruzi* (E. S. R., 23, p. 585) in the intestinal canal of the common bug *Triatoma infestans*.

Further observations on the presence of iodin in tuberculous tissues and in the thyroid gland, P. A. Lewis and R. B. Krauss (*Jour. Biol. Chem., 22 (1915), No. 1, pp. 159–163*).—The authors conclude that "iodin is frequently present in tuberculous tissue independently of any intentional administration of iodin-containing substances. The quantities found are such as to lessen the force of the conclusion of previous observers that the tuberculous tissue has an especial affinity for iodin when intentionally administered. This may of course be the case, but the evidence for it is so far insufficient. We have no evidence bearing on the nature of the iodin compounds in the tuberculous

tissue or the source from which they are derived. The iodin is, however, independent of thyroid iodin in its quantitative relationships.

"The thyroid gland of rabbits may at times be free from any appreciable amount of iodin."

See also a previous note (E. S. R., 33, p. 283).

Serological examination in pulmonary tuberculosis with the optical method, A. E. LAMPÉ and J. CNOPF (*Fermentforsch., 1 (1915), No. 3, pp. 269–310*).—From experimental data submitted the authors conclude that in those cases which are not enemic or manifest no other clinical symptoms there are in general no ferments in the system which can digest peptone prepared either from normal or tuberculous lung tissue or from tuberculosis bacilli. Individual cases, however, were found in which the serum contained the specific ferments.

In positive cases of pulmonary tuberculosis the ferments were always found which digested the substrates used. The intensity of the ferment action seems to decrease as the disease progresses and finally disappears. The authors believe that there is a "blood-ferment death" (Blutfermenttod) when the ferments no longer exist in the blood, and that it is necessary to consider this fact in defending the dialysis and optical methods against false criticism. From the protocols conclusions are drawn as to the diagnostic and prognostic value of the optical method in tuberculosis.

The vaccination of cattle against tuberculosis.—III, The occasional persistence of the human type of tubercle bacillus in cattle, T. SMITH and M. FABYAN (*Jour. Med. Research, 32 (1915), No. 3, pp. 523–537*).—It is indicated that the injection of the human type of tubercle bacilli into calves may, in rare cases, lead to the subsequent shedding of such bacilli in the milk. The bacilli apparently lodge in the undeveloped udder and appear to be less readily destroyed there than in other organs and tissues. The studies of a particular case have shown that the human type of bacillus maintains its characteristics even after remaining under the influence of bovine tissues for several years.

The use of vaccines of the human type of bacillus for practical purposes is not, therefore, to be generally advocated. "The situation as it has been developed by experimental work is, on the whole, against the use of such vaccines, unless the milk from cows vaccinated as calves is either thoroughly tested or else pasteurized before use."

See also a previous note (E. S. R., 26, p. 680).

A remedy for clover bloat, D. J. HEALY and J. W. NUTTER (*Kentucky Sta. Circ. 5 (1915), pp. 10–12*).—The data here presented have been previously noted from another source (E. S. R., 33, p. 388).

The cause and occurrence of contagious abortion in cattle, E. C. SCHROEDER (*Jour. Amer. Vet. Med. Assoc., 48 (1915), No. 3, pp. 304–310*).—This paper, presented at the fourth annual meeting of the International Association of Dairy and Milk Inspectors, October 28, 1915, at Washington, D. C. (E. S. R., 33, p. 701), includes a brief review of the present status of knowledge of this disease.

Investigations into the cause of worm nodules (Onchocerca gibsoni) in cattle, at Darwin, Northern Territory, Australia, J. F. MCEACHRAN and G. F. HILL (*Melbourne: Govt. [1915], pp. 8; abs. in Trop. Vet. Bul., 3 (1915), No. 4, pp. 133, 134*).—The results of the authors' experiments are summarized as follows:

"Local cattle may become infected with worm nodules a few months after birth, as well-developed nodules were found in calf (b). Cattle from Victoria, where worm nodules are rarely, if ever, present, grazing in the ordinary manner with infected cattle, may become infected with *O. gibsoni* within six months, as

typical nodules were discovered in calf (a). No evidence can be adduced regarding the mode of infection.

"The housing arrangements of calves (c) and (d) were such that biting and flying insects had ready access to the animals, and as the distance from the infected cows was not great we can certainly assume that these biting and flying insects had good opportunities for infecting the calves. The fact that they were not affected during the seven to eight months' period of exposure to possible insect vectors apparently indicates that the intermediary host is not a biting or flying insect, and even an ordinary skin parasite, e. g., *Hypoderma tuberculatus*, which travels a short distance, may be eliminated.

"The negative result of this experiment as also [that to ascertain the rôle played by insects in carrying *O. gibsoni*] points to the probability of the intermediary host of *O. gibsoni* being on the ground. Both pens were floored with concrete; the experimental calves had no chance of lying on or near the ground where infected cows had previously laid. It seems to us to indicate that part of the life history of the parasite is spent on the ground.

"Since these experiments were finalized, we have received Cleland's report on his further investigation into the etiology of worm nests in cattle [E. S. R., 32, p. 377]. We note his remarks on the possibility of *Stormoxys calcitrans* or *Culicelsa vigilax* acting as intermediary hosts of *O. gibsoni*. In the light of our knowledge here and in view of the results of the experiments conducted at the laboratory, we can not add support to his contentions."

Investigations into the occurrence of onchocerciasis in cattle and associated animals in countries other than Australia, GEORGINA SWEET (*Melbourne: Govt. [1915], pp. 53, pls. 7; abs. in Trop. Vet. Bul., 3 (1915), No. 4, pp. 130–133*).—The present paper is based upon investigations made during the course of an extended tour of the world. The worm nodules in the connective tissues caused by species of Onchocerca, now known to exist in cattle and associated animals, are listed in tabular form, as are the allied parasitic worms present, as previously known, in the main aortæ of cattle and buffalo.

"The new species herein described from cattle in India, while overlapping in some respects the allied species *Onchocerca gibsoni* and *O. gutturosa*, differs from those in the association in the male worm of a certain range of length of the larger spicule intermediate between those two species, with a greater number of differently arranged anal papillæ than is found in either of them, and from *O. gibsoni* further in the thicker head of the male, the thinner head and tail of the female, and the generally longer esophagus in both.

"The limitations of these species appear to be geographical rather than otherwise, thus, *O. gutturosa* is characteristic of northern Africa, presumably in *Bos taurus; O. indica* is found in *B. indicus* in the peninsula of India; and *O. gibsoni* in *B. indicus* in the Malay Peninsula and as a very variable form in *B. taurus* in Australia, and most probably the Malay Archipelago. The occurrence of such nodule-forming worms is probably much wider than is at present suspected."

A bibliography of 34 titles is appended.

Complement fixation in hog cholera, D. J. HEALY and W. V. SMITH (*Jour. Infect. Diseases, 17 (1915), No. 1, pp. 213–218*).—While working on the etiology of hog cholera at the Kentucky Experiment Station the authors have obtained an antigen from the mesenteric glands of acute cholera hogs which shows striking differences in its reaction toward normal hog, rabbit, and cow sera and hyperimmune hog serum. This antigen is not removed from the extract by passage through an ordinary porcelain filter, but is removed by passage through the "F" bougie. The antigen is not found in the freshly prepared

extract of the glands but requires a definite period for development. It is not stable and gradually disappears from the extract.

The action of a coal-tar disinfectant on hog cholera virus, W. E. King and R. H. Drake (*Jour. Amer. Vet. Med. Assoc., 48 (1915), No. 3, pp. 315, 316*).—The results of experiments here reported in tabular form indicate that highly virulent hog cholera virus (in the form of serum from cholera infected hogs) exposed for 5 minutes to the action of a 2 per cent solution of Kreso is rendered inert.

Lupinosis of horses and the treatment, A. D. Knowles (*Jour. Amer. Vet. Med. Assoc., 48 (1915), No. 3, pp. 286–303, figs. 3*).—This account of lupinosis includes reports upon experiments with a number of cases and the nature of the lesions caused. It is stated that some of the animals which were placed on the artificial Carlsbad salts treatment a few weeks previous were making satisfactory improvement at the time of writing. A list of 10 references to the subject is appended. A discussion entered into by several follows (pp. 300–303).

Blackhead in turkeys, R. Graham and L. R. Himmelberger (*Kentucky Sta. Circ. 7 (1915), pp. 35–44, figs. 3*).—A popular account.

RURAL ENGINEERING.

Trenching machinery used for the construction of trenches for tile drains, D. L. Yarnell (*U. S. Dept. Agr., Farmers' Bul. 698 (1915), pp. 26, figs. 15*).—This publication describes the types of trenching machinery used for the construction of trenches for tile drains, under the four general classes of (1) plows and scoops, (2) wheel excavators, (3) endless-chain excavators, and (4) scraper excavators, and discusses the limiting conditions of operation and the factors affecting the cost of trenching. Back-filling and tile-laying devices are also described.

The requisites of a good trenching machine are stated as follows: (1) It must operate efficiently through various kinds of soil, (2) it must be capable of cutting true to grade, and (3) it must work for long periods without breaking or otherwise getting out of order. Good materials, proper proportioning of strength, and simplicity of construction are also desirable.

It is pointed out that while there is not a great difference in the cost of trenching by hand and machinery, the advantage of the latter method is in the shorter time required to install drains and the less trouble in securing the few workmen needed.

"In selecting a trenching machine the prospective purchaser should consider carefully the amount of work to be done by it, the dimensions of the trenches to be dug, the nature of the soil to be excavated, and other conditions of work. The wheel type of excavator is most generally used for installing farm drains, probably owing to a lower cost for the smaller sizes than the cost of the chain type. Machines of the latter kind have greater range in size of trench than wheel excavators of the same weight and seem to be better adapted for work when there is a great deal of 8-in. tile and larger. When the greater portion of a job is small tile at ordinary depths, the excavator should be suited to the major part."

The weight of the excavator is important in digging soft earth and may make necessary the use of apron tractors instead of the less expensive wheels. "Sometimes internal-combustion engines are preferred to steam equipment because they weigh less. Internal-combustion engines are also quite popular for the smaller machines because the number of men required for operation is less,

but they are not so dependable for continuous operation as steam engines, and the latter equipment is, therefore, generally preferred for large machines. . . .

"If a landowner expects to install 100 rods of tile drain in soil which would require picking, but which contains no rock, he would be justified in buying a ditching plow costing as much as $20. If he proposes to construct 1,500 rods of tile drain in soil free from rock and large roots, the landowner can well afford to purchase a horse-drawn ditching plow costing from $250 to $300; and if it be assumed that the owner can sell his machine when his ditching is completed for $100, he would be justified in purchasing such a machine for the construction of 1,000 rods of drain. For the installation of as much as 5,000 rods of drain in a soil free from rock and large roots, the purchase of a power-driven trenching machine costing as much as $1,500 probably would be justified, on the assumption that the machine could subsequently be sold for one-half its original cost. . . . In comparing the real costs of different machines and implements one must consider not only the purchase price and the operating cost of fuel, oil, and labor, but also repairs, interest on the investment, and depreciation."

Investigation of the durability of cement drain tile in alkali soils, R. J. Wig, G. M. Williams, et al. (*U. S. Dept. Com., Bur. Standards Technol. Paper 44 (1915), pp. 56, pls. 20, figs. 16; abs. in Engin. Rec., 72 (1915), No. 8, p. 220*).—This bulletin describes several concrete structures exposed to alkali water which have failed in the Western States, and reports the first-year results of service and laboratory tests of 8,800 hand and machine made concrete drain tile made up of 16 different types, the proportions of cement and sand varying from 1:1½ to 1:4. The curing was either by sprinkling or by steam. The tile were installed in operating drains on eight projects, comprising the most concentrated alkali soils of the West, and for comparison on projects where there was practically no alkali.

The results of the tests of tile were, as a whole, quite uniform and compared favorably with other tests of drain tile. Occasionally results of tests of similar tile differed by 30 or 40 per cent, but usually they agreed within a few per cent. Some of those which had a normal or only slightly reduced strength showed evidence of alkali action by softened edges or cracked surfaces. "The great majority of the tile were unaffected in any manner at any of the projects. At Sunnyside, Wash.; Yuma, Ariz.; and Roswell, N. Mex., none of the tile showed any abnormality whatever. At Garland, Wyo., the leanest mixtures showed reductions in strength considerably below the averages for these series at all points." At Fort Shaw, Mont., reduced strength was shown in two cases of handmade, steam-cured tile of 1:2 mixture of plastic consistency. "At Grand Junction, Colo., the tile made of the leanest mixture were swollen and cracked. The tile made of sand-cement, while of normal strength, showed a softening at the edges, and several square inches of one of the tile were similarly affected, although the breaking strength was normal. At Huntington, Utah, the tile of series 6 [handmade ,steam-cured, 1:2 mixture] appeared to be affected by the alkali. Although these tile withstood loads of over 1,400 lbs., there were a number of longitudinal and circumferential cracks apparent before testing, and the fractured surfaces appeared white. . . . At Montrose, Colo., the tile [made of sand-cement] appeared to have been affected by alkali. On one of the tile the concrete at one end was softened, apparently due to alkali, and both failed under comparatively small loads. . . .

"The absorption of moisture by the walls of the tile of the various series was noticeable at the different projects. The apparent amount of absorption varied with the amount of water present in the soils at the various points, and it was found that some of the series would be apparently saturated where the

ground was barely moist while other series were apparently only slightly damp, even where the drain was filled with mud and water. Of the handmade tile and under the worst conditions series 2 [of 1:2½ mixture] was, with very few exceptions, found to be slightly damp, as indicated by the appearance of the fractured surfaces. . . . The richest mixtures used were nearly always found partially or completely saturated. . . . The tile of series 14 [of 1:3 mixture], next to those of series 2, showed the smallest amount of absorption, while the tar-coated tile of series 5 [1:2 mixture] and the tile of series 6 [1:2 mixture], containing ferrous sulphate, were usually found to show the greatest absorption. . . . The absorption of the machine-made tile varied as the amount of cement contained in them. The tile of series 9 and 10 [1:1½ mixture] were usually found apparently dry or only partially saturated with a few wet spots in the fractured surfaces while the tile of the leanest mixtures were always found saturated."

It is concluded that special care should be observed to employ only the best materials and good workmanship in fabrication of drain tile. If these precautions are not observed failure will result if the drain is located in some of the more concentrated alkali soils similar to those found at Grand Junction, Colo., and Garland, Wyo.

"Drain tile manufactured . . . of cement mixtures not leaner than 1 part cement to 3 parts aggregate are apparently unaffected structurally when exposed for one year in operating drains in very concentrated alkali soils. . . . Drain tile made from cement mixtures leaner than 1 part cement to 3 parts of aggregate should not be used in localities where the character of the alkali and concentration are similar to that found at the site of the experimental drain at Grand Junction, Colo.; Montrose, Colo.; and Garland, Wyo. . . . Drain tile manufactured of 1 part cement to 4 parts of aggregate, the leanest mixture used, is apparently unaffected structurally by exposure for one year in an operationg drain in localities where the character of the alkali and the concentration are similar to those found at Fort Shaw, Mont.; Sunnyside, Wash.; Yuma, Ariz.; and Roswell, N. Mex."

Cost of drainage pumping in southern Louisiana, C. W. OKEY (*Engin. News, 74 (1915), No. 16, pp. 733–735*).—Data on the cost of operation of drainage pumping plants in southern Louisiana, secured in connection with investigations carried on since 1909 by the Office of Experiment Stations of the U. S. Department of Agriculture, are reported, together with full information on the kind and cost of fuel and labor and on the equipment of each station. According to the tables, the cost varied with the conditions from 4.1 to 16 cts. per acre-foot per foot of lift, the cost unit used.

A previous report along similar lines in which the author is interested has been noted from another source (E. S. R., 34, p. 283).

Farm drainage in North Carolina, H. M. LYNDE (*North Carolina Sta. Bul. 234 (1915), pp. 32, pl. 1, figs. 14*).—This bulletin, prepared in cooperation with the Drainage Investigations of the U. S. Department of Agriculture, emphasizes the general need for better farm drainage in North Carolina, and deals in a popular manner with the underlying principles and practice of the subject, with particular reference to North Carolina conditions. "Farm drainage is one of the most important agricultural operations with which the farmer in North Carolina has to deal. Drainage lies at the basis of successful agriculture in the Coastal Plain region, which comprises an area of over 14,000,000 acres, nearly one-half the total area of the State. . . . It has been estimated that from five to six million acres of land now under cultivation in the State are in need of better drainage."

A test of drainage, A. H. Rosenfeld (*Rev. Indus. y Agr. Tucumán, 5 (1915), No. 9, pp. 369–371*).—Deep ditch drainage of sugar cane soil was found to increase the yield of sugar cane ¾ tons per hectare (about 670 lbs. per acre) over that from undrained, but deeply plowed, cane soil.

Note on the level of the water in the subsoil of the Gangetic plain, E. A. Malony (*Dept. Land Rec. and Agr. United Prov. Agra and Oudh, Agr. Ser., Bul. 33 (1915), pp. 9*).—The factors affecting ground-water level are discussed, with particular reference to the Gangetic plain.

It is pointed out that an appreciable lowering of the ground-water level in that locality caused by excessive run-off, evaporation, moisture utilization by vegetation, or other factors may seriously diminish or completely cut off the supply of water of wells in places where much dependence is placed upon the well water for irrigation or other purposes. In order to maintain the ground-water level it is considered necessary to increase the capacity of the lakes and swamps which catch the rainfall and so permit some of the water held back to percolate into the subsoil, and to open up a more rapid communication between the surface and subsoil reservoirs.

The farm water supply, O. M. Kile (*W. Va. Col. Agr. Ext. Dept. Circ. 43 (1915), pp. 15, figs. 12*).—This circular outlines briefly simple methods of improving the various kinds of farm water supplies, and describes several simple water-supply systems now in use on West Virginia farms.

Annual irrigation revenue report of the Government of Bengal for the year 1913–14 (*Ann. Irrig. Rev. Rpt. Bengal, 1913–14, pp. II+101, pls. 9*).—This reports the physical and financial condition of irrigation works in Bengal and describes irrigation activities for the year 1913–14.

Elements of highway engineering, A. H. Blanchard (*New York: John Wiley & Sons, 1915, pp. XII+514, figs. 202*).—This book, intended for the use of engineering students, consists of original matter and of material from a previous book by the author and H. B. Drowne (E. S. R., 30, p. 289) "which has been revised and remodelled to meet the requirements of a book suitable for use by engineering students. . . . Each chapter has been written with a view to emphasizing the fundamental principles which have been evolved from past experience as well as from the modern practice of highway engineering which, as a science and an art, is rapidly developing in the fields of economics, administration, legislation, materials, and methods."

The chapters included are as follows: Economics, administration, legislation, and organization; preliminary investigations; surveying, mapping, and design; grading, drainage, and foundations; earth and sand-clay roads; gravel roads; broken stone roads; bituminous materials; dust prevention and bituminous surfaces; bituminous macadam pavements; bituminous concrete pavements; sheet asphalt and rock asphalt pavements; cement-concrete pavements; wood block pavements; brick pavements; stone block pavements; street cleaning and snow removal; comparison of roads and pavements; sidewalks, curbs, and gutters; and highway structures.

Three appendixes giving a glossary of terms applicable to highway engineering and describing in detail methods for determining physical and chemical properties of bituminous and nonbituminous highway materials are also included.

Brick monolithic construction of county highways, R. L. Bell (*Engin. and Contract., 44 (1915), No. 14, pp. 268–270, figs. 9*).—The construction of a brick pavement having a concrete base and a brick wearing surface is described, in which "the brick are placed directly on the concrete while it is still green so that to all intents and purposes the road is made up of one solid slab." The advantages of this type of brick pavement are stated as follows: "(1) A better

surface can be obtained, (2) the work is easier on both contractor and inspector, (3) there is no guesswork at any point of the construction, (4) under similar conditions it represents a saving of from 10 to 12 cts. per square yard over the old method, (5) eliminates the breaking down of the filler at a construction crack, as each brick has a rigid support, (6) opens the field for experiment with thinner brick, (7) the filler is sure to reach the bottom of the paving block, (8) removes need of a flush curbing, and (9) eliminates the rumbling in brick pavements."

Twenty-second annual report of the Massachusetts Highway Commission, for the year ended November 30, 1914 (*Ann. Rpt. Mass. Highway Com., 22 (1914), pp. 206, pls. 5*).—This report contains data on work and expenditures in Massachusetts on road location, construction, and maintenance in 1914, together with considerable statistical data.

Report of the State Highway Department of Pennsylvania for the period June 1, 1913, to June 1, 1914, E. M. BIGELOW (*Rpt. Highway Dept. Penn., 1913–14, pp. 59, pls. 12*).—This reports the activities of the Pennsylvania Highway Department during the year ended May 31, 1914.

Machinery cost of farm operations in western New York, H. H. MOWRY (*U. S. Dept. Agr. Bul. 338 (1916), pp. 24*).—The results of an inquiry addressed to several thousand farmers in Niagara, Orleans, Monroe, Wayne, Genesee, Livingston, and Ontario counties in western New York to determine how much service standard farm machinery gives in that locality under the average existing conditions are reported. "Reports were obtained for 1,165 walking plows, 294 sulky plows, 1,169 spring-tooth harrows, 824 spike-tooth harrows, 738 disk harrows, 1,173 land rollers, 1,061 grain drills, 72 one-row corn planters, 97 two-row corn planters, 1,114 one-horse cultivators, 881 riding cultivators, 217 cabbage transplanters, 359 engine sprayers, 1,232 mowers, 1,217 hay rakes, 416 hay tedders, 563 bean harvesters, 1,028 grain binders, and 458 corn binders."

The following table summarizes the average service and cost of these implements:

Average service rendered by 18 kinds o ffarm implements in western New York, and average machinery cost per acre.

Implement.	Average days' work per year.	Life of implement.		Acres covered.		Cost per acre covered.				Cost, new.
		Days of work.	Years.	Per year.	Total.	Replacement.	Interest.	Repairs.	Total.	
Walking plow	19.2	224	11.7	32.9	384.9	$0.026	$0.010	$0.062	$0.098	$10.00
Sulky plow	14.7	119	8.1	30.9	250.3	.170	.046	.069	.285	42.50
Spring-tooth harrow	6.6	73	11.0	71.1	782.1	.023	.007	.011	.041	17.50
Spike-tooth harrow	3.1	43	14.0	48.3	676.2	.016	.007	.007	.030	10.50
Disk harrow	4.2	54	13.0	35.2	457.6	.059	.025	.014	.098	27.00
Land roller	4.7	75	16.0	65.9	1,054.4	.023	.011	.007	.041	24.00
Grain drill	4.6	76	16.4	46.3	759.3	.095	.049	.027	.171	72.00
Corn planter, 1-row	.9	10	11.7	4.1	48.0	.250	.111	.170	.531	12.00
Corn planter, 2-row	.8	9	11.0	8.2	91.3	.440	.158	.200	.798	40.00
Cultivator, 1-row	4.1	58	14.0	16.9	236.6	.027	.012	.021	.060	6.50
Cultivator, 2-row	5.6	70	12.5	39.3	491.3	.065	.027	.025	.117	32.00
Cabbage transplanter	3.4	43	12.8	12.5	160.0	.280	.114	.091	.485	45.00
Mower	3.1	46	14.8	28.0	414.4	.099	.047	.065	.211	41.00
Hay rake	2.6	37	14.5	43.0	623.5	.038	.019	.008	.065	24.00
Hay tedder	1.5	21	14.0	21.6	302.4	.112	.051	.019	.182	34.00
Bean harvester	2.3	29	12.9	16.9	218.0	.115	.048	.060	.223	25.00
Grain binder	3.4	53	15.4	35.2	542.1	.231	.113	.058	.402	125.00
Corn binder	3.7	40	10.8	21.1	227.9	.550	.194	.096	.840	125.00

It was found that the average farm machine used in the section is less than half worn out by use alone. The more days of actual use obtained annually

from an implement the greater is its total of days and acres of work done before wearing out, and the less is the interest charge per acre and per day actually used.

"The replacement cost per acre or per bushel or ton is from two to seven or eight times as great for small acreages as for large acreages. The farmer with a small acreage can not compete in economy in the use of machinery with the farmer having a larger business. With the best of shelter and care, the small farm can only hope to equal the replacement cost per unit enjoyed by the large farm; it can not hope to avoid higher interest charges. As a rule, it is not profitable to build for machinery any special shelter which adds over 15 per cent to the total machinery investment on a farm. Repair charges per machine increase with increasing use, but not in proportion to the amount of work done. Repair charges per acre and per day decrease as the acreage covered annually increases. The larger and more substantial sizes of machinery give cheaper service than the lighter sizes, since the cost for repairs is much lower for the heavy machine than for the lighter machine, while the first cost is but a fraction greater."

Competitive tests of agricultural machinery, ALBERT, FISCHER, and KEISER (*Arb. Deut. Landw. Gesell., No. 273 (1915), pp. 75, figs. 92*).—This is a classified report of trials of a number of recent developments in agricultural machinery, especially mowing machines, hayrakes, and hay tedders.

Boiler laws and their relation to traction and portable engines, G. G. DANA and J. MAINLAND (*Amer. Thresherman, 17 (1914), Nos. 6, pp. 28–32, figs. 2; 7, pp. 44, 45, figs. 2; 8, pp. 30–32, 81*).—It is the purpose of this article to point out some of the differences existing in the various laws regarding boilers in some of the States and in the neighboring Canadian Provinces, and to compare their relative merits in the hope of promoting uniformity in boiler laws.

It is concluded that each one of the laws discussed is good individually and that a boiler constructed in compliance with any one of them would be safe and durable, but that it is difficult for a manufacturer to build a boiler that meets the requirements of them all at the same time.

The Canadian method of having boilers and appliances approved is recommended as having an advantage over the procedure in the United States. "Boiler materials as specified by the Alberta and Saskatchewan rules seem better adapted to the various parts than those specified by the other rules.

"The results obtained from figuring the efficiencies of joints agree very closely when obtained by the different formulas . . . but the Ohio and Massachusetts methods seem more comprehensive and rational. However, their rules make no mention of the distance between rows of rivets, while all the Canadian rules cover this point in a very elaborate and cumbersome manner. . . .

"A graduating factor of safety as adopted by the Canadian rules to take care of the different types of joints, class of workmanship, and designs apparently has an advantage over the Ohio and Massachusetts method of restricting the use of lap joints on the longitudinal seams to pressures under 100 lbs. and using five as a constant factor of safety for all constructions. The drilling of rivet holes from the solid plate or reaming them a liberal amount from a hole that has been punched is no doubt a step toward safety, and the rules regarding this point as given by Ohio and Massachusetts, if revised as suggested, would facilitate manufacturing without weakening the construction."

"There is a wide difference in regard to the working pressures allowed on flat surfaces by the various rules, Alberta being the most stringent and British Columbia the most liberal. . . . The portion which is considered self-supporting on heads of boilers is much less for Alberta than for British Columbia, while the rules for Ohio and Massachusetts make a uniform allowance regardless of the

thickness of plate and working pressures. A slight modification of the Alberta formula would make a practical and safe rule for uniform adoption. The requirements regarding crown sheets for traction and portable boilers as given by the Alberta and Saskatchewan rules are commended, with slight modifications in the angularity allowed for the stay bolts to deviate from the radial lines."

It is considered practicable and desirable for boiler laws and rules to be uniform for all the States and Canadian Provinces.

The relation of drawbar pull to the weight of a tractor, C. M. Eason (*Threshermen's Rev., 24 (1915), No. 8, pp. 8, 37, fig. 1*).—A brief analysis of the relation of drawbar pull to the weight of the tractor is given, and data from different experiments are presented which indicate that the general tendency in tractor development is toward obtaining more drawbar pull with less weight of tractor.

Testing the drawbar horsepower of tractors, C. M. Eason (*Threshermen's Rev., 24 (1915), No. 9, pp. 14, 15, figs. 2*).—A recording dynamometer for traction-engine testing is described and illustrated. This consists essentially of a hydrostatic pressure unit which is hitched between the tractor and the load being pulled, and a recording pressure gage connected to the hydrostatic unit by means of a flexible tube. The dial of the recording gage is driven by a gear reduction connected by means of a speedometer shaft to a trailer wheel which runs on the ground. To obtain the elapsed time a clock is provided having a recording arm which checks the time intervals on the margin of the pressure gage chart.

Practical application of industrial and agricultural machinery for peat bogs, L. A. Krupp (*Jour. Amer. Peat Soc., 8 (1915), No. 1-2, pp. 1-11, figs. 4*).—This article discusses the essentials of machinery for the manufacture of peat fuel, fertilizer filler, peat humus, etc., and agricultural machinery, including drainage and ditching machines, tractors, and the like designed for the preparation of humus and peat soils for cropping.

Capacity test of peat machine, G. Keppeler and C. Birk (*Mitt. Ver. Förd. Moorkultur Deut. Reiche, 33 (1915), No. 10, pp. 251-258, figs. 5*).—This article describes a recently developed machine for the obtaining of peat on a large scale from peat swamps and reports capacity tests. The results show that 399 tons of raw peat were obtained in 10 working hours.

Tests of new dairy machinery, B. Martiny (*Arb. Deut. Landw. Gesell., No. 277 (1915), pp. 56, figs. 31*).—This is a classified report of preliminary tests of a number of recent developments in dairy equipment.

Description of the milking machines tried at the Alnarp Institute (Official Swedish Experiment Station for Agricultural Machines and Implements), F. L. Rosengren (*Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases, 6 (1915), No. 2, pp. 285-290, pls. 2*).—Tests of five suction and five pressure milking machines are reported.

The results showed that the cows submitted to the pressure machines less easily than to the suction machines. The former also worked more slowly. The quantity of milk obtained per minute was, in general, smaller than that obtained by hand milking. With quiet cows, easy to milk, the intensity of machine milking, at least in the case of suction machines was, in general, as good as by hand milking, and often superior. The quantity of milk obtained per minute depended not only upon the manner in which the machine worked and the quietness of the cow, but also on the stripping and the care of the milker. The greater the yield of a cow the greater was the quantity of milk obtained per minute. Complete milking out by machine to the last drops of milk caused the quantity of milk per minute to fall.

The intensity of machine milking was determined by taking the quantity milked by hand as equal to 1 and calculating the corresponding amount obtained with a machine. The intensity of pressure-machine milking ranged from 0.41 to 0.58, and that of the suction machines from 0.6 to 0.84. The intensity of machine milking increased as the cows become accustomed to it, this being more visible for suction machines than for pressure machines. It was also observed that the intensity can be increased by weighting the teat cups, so that the udder and the teats are somewhat lengthened. Suction machines were better with regard to stripping the cows, though this depended on the temper of the individual cows.

"By using milking machines, provided they be well cleaned, a much purer and wholesomer milk is obtained than by hand milking, but if cleanliness is neglected and the pipes and tubes are left attached to the machine between milkings, then machine-drawn milk contains more germs than hand-drawn milk and its keeping qualities deteriorate. The best and simplest way of keeping the rubber tubes sweet is to wash them well after using and to keep them in cold pure water until they are again required.

"The influence of machine milking on the yield compared with hand milking could not be definitely determined in the trials. The yield sinks more or less when machine milking replaces hand milking, but it rises again rapidly as the cows get accustomed to the machines."

Cream separator and churn, L. AMMANN (*Ann. École Nat. Agr. Grignon, 4 (1913), pp. 112–122, fig. 1*).—Tests of a centrifugal cream separator showed that under normal working conditions the best separation of cream was obtained with 70 revolutions of the handle per minute and a flow of milk of from 100 to 110 liters per hour. The best temperature was from 32 to 36° C. The best results were obtained when not more than from 30 to 50 liters, according to the milk, were treated in each operation. Increasing or decreasing the optimum speed decreased the amount of cream separated.

Tests of a churn made to accommodate 8, 12, or 24 liters of cream are also reported.

The colony hog house, J. D. MCVEAN (*N. C. Agr. Ext. Serv. Circ. 3 (1915), pp. 8, figs. 6*).—Plans, specifications, and a bill of materials for a colony hog house are given.

Poultry house construction, H. E. UPTON (*Brit. Columbia Dept. Agr. Bul. 63 (1915), pp. 40, figs. 38*).—This bulletin describes and illustrates poultry houses suitable for the lower mainland, the lower gulf islands, and the southern part of Vancouver Island of the Province of British Columbia. "In other parts of the Province, according to the coldness and dampness of the atmosphere, the houses should be altered to meet the conditions."

From Chilliwack to Kamloops and from Cowichan to Comox it is suggested that houses be built at least 16 ft. in depth. For other parts of the Province, where the cold is extreme, it is thought that the houses should be built at least 18 ft. in depth. "In constructing poultry houses, one should never build them under 12 ft. in depth or over 22 ft. The former would allow too much air circulation in the house and the latter would allow too much dampness to collect that would not dry out during the day."

The biological purification of dairy sewage, F. W. J. BOEKHOUT and J. J. O. DE VRIES (*Molk. Ztg. Berlin, 25 (1915), Nos. 27, pp. 209, 210; 28, pp. 217, 218; 29, pp. 225, 226*).—In experiments conducted in Holland it was found that dairy sewage can be successfully purified by the proper use of a septic tank and biological filters.

Report on methods of purification of sugar refinery sewage, U. BERTHOLET (*Bul. Serv. Santé et Hyg., 1913, Sup., pp. VIII+122; abs. in Wasser u. Abwasser, 9 (1915), No. 11, pp. 389, 390*).—This report describes the processes of purification of sugar refinery sewage employed in Belgium, and reviews the processes employed in Germany, Austria-Hungary, France, Italy, and Russia.

The first section discusses the composition of the sugar beet. The second section points out that sugar refinery sewage is highly putrefactive and a nuisance, owing to its content of nitrogenous and nonnitrogenous organic matter, and is contaminating to the air and to rural and other water supplies. Mechanical, chemical, and biological methods of purification used are described. The mechanical processes consist mainly of reduction and filtration, the chemical process of reduction, precipitation, and filtration, and the biological process of the oxidation of organic matter in natural soil.

Recent results of experiments on the purification of sewage by aeration in the presence of activated sludge, at the University of Illinois, E. BARTOW and F. W. MOHLMAN (*Engin. and Contract., 44 (1915), No. 22, pp. 433, 434, fig. 1*).—A continuation of the experiments previously noted (E. S. R., 33, p. 786) on a larger scale is reported. The purpose was to determine the amount of air required, the best method for distributing the air, the time required for purification, and the quantity and quality of activated sludge formed.

It is concluded "that activated sludge may be built up by changing sewage at frequent intervals without complete nitrification of each dose of fresh sewage. A considerable degree of purification is also obtained from the beginning of the operation, and the time for building up adequate sludge for the process is cut down very decidedly."

One sq. ft. of filtros plate for air diffusion was not sufficient for 10 sq. ft. of floor area in a tank, and 3 sq. ft. of plate per 10 sq. ft. of floor area gave the best results. "It is quite essential that the plates be as nearly as possible at the same level. A variation of $\frac{1}{4}$ in. in level will cause uneven air distribution. The distribution seems to become more uniform the longer the plates are used. . . . The greatest efficiency in air consumption will be obtained when enough air is used to make the sewage nonputrescible and to keep the sludge activated."

The new equipment used in the experiments is also described.

The treatment of sewage by aeration in the presence of activated sludge, E. BARTOW (*Metallurg. and Chem. Engin., 13 (1915), No. 15, pp. 901–904, figs. 6*).—The substance of this article has been noted above.

Sewage disposal by means of the septic tank, J. GRAHAM (*Dom. Engin., 73 (1915), No. 7, pp. 198–200, figs. 7*).—Detailed descriptions, with illustrations, of the construction of the septic tank and the tile distribution system of residential sewage disposal are given, including a plan and section view of a tile system on a slope.

The action of certain bacteria on the nitrogenous material of sewage, E. G. BIRGE (*Amer. Jour. Pub. Health, 5 (1915), No. 10, pp. 1048–1056*).—Studies on the effect of *Bacillus coli communis*, *B. cloacæ*, *B. pyocyaneus*, *B. proteus vulgarus*, *B. mesentericus ruber*, and *B. subtilis* under aerobic and anaerobic conditions and in pure cultures and in symbiosis on fresh, filtered, and sterilized sewage are reported, the object being apparently to throw light on the action taking place in a septic tank. Particular attention was paid to the effect on free ammonia, organic nitrogen, nitrites, and nitrates.

"Bacteriologically it was shown that *B. coli* was completely overgrown under anaerobic conditions in the 24-hour period. Under aerobic conditions it was

able to overgrow *B. pyocyaneus*, but was overgrown by the rest of the bacteria studied.

"When grown in pure cultures, with the exception of *B. proteus vulgarus*, the bacteria gave more constant results under aerobic than anaerobic conditions.

"*B. subtilis* showed a marked ammonifying power throughout the work under aerobic conditions. Under anaerobic conditions it regularly decreased the free ammonia and organic nitrogen content, increasing the nitrites and nitrates, especially the latter.

"*B. coli* and *B. cloacæ* had a decided reducing action on both the nitrites and nitrates. Under some conditions, as yet undetermined, they reduced the free ammonia content also.

"*B. proteus vulgarus* had a considerable ammonifying power under anaerobic conditions. This was very slight under aerobic conditions and was more constant at room temperature than at 37.5° C.

"The action of *B. pyocyaneus* and *B. mesentericus ruber* was irregular under both aerobic and anaerobic conditions.

"The experiments in symbiosis showed that the chemical changes followed very closely those of the predominant bacteria in pure culture. Those experiments which did not follow this rule, and in which there was a decided predominance of one micro-organism, showed that the bacteria had become predominant too late in the incubation period to effect a marked chemical change.

"*B. coli* and *B. cloacæ*, *B. coli* and *B. proteus vulgarus* gave more constant results when grown symbiotically than when grown in pure culture. These were the only instances of an apparently true symbiotic growth.

"The results of the experiments, in which more than two bacteria were grown symbiotically, showed that the incubation period, 24 hours, was too short to allow any one micro-organism or any group of bacteria to establish itself chemically."

These results are taken to indicate that if a group or species of organisms predominates in sewage the changes in its chemical composition may be predicted, but are not considered sufficient to justify an attempt to control the flora of the septic tank.

Resolutions concerning disposal of human excreta at unsewered homes (*Pub. Health Rpts. [U. S.], Sup. 22 (1915), pp. 2*).—The resolutions adopted by the Thirteenth Annual Conference of State and Territorial Health Authorities with the U. S. Public Health Service with reference to the disposal of human excreta in rural districts are given.

RURAL ECONOMICS.

Farm management practice of Chester County, Pa., W. J. SPILLMAN, H. M. DIXON, and G. A. BILLINGS (*U. S. Dept. Agr. Bul. 341 (1916), pp. 99, pls. 2, figs. 10*).—The more important of the funadmental principles of farm management brought out clearly in this study of the operations of 643 farms, and confirming similar studies, are summarized as follows:

"The type of farming followed in any given case must be adapted to local soil, climatic, and labor conditions, and especially to local conditions with reference to markets and market facilities, as well as to the business conditions existing on the individual farms.

"When the conditions affecting the agriculture of a region have remained stable for a considerable period local agricultural practice tends to become approximately what it should be for best results, provided the practice which gives the best immediate returns does not unfavorably affect soil fertility.

When conditions change, even slightly, if the change is permanent, local farm practice begins to change and ultimately adapts itself to the new conditions.

"Success in farming, measured in terms of the family income and standard of living, is directly proportional to the magnitude of the farm business, although the percentage of profits on the farm investment is, within wide limits, independent of the magnitude of business. With the types of farming generally adapted to this locality many of the farms found in this survey are too small to permit a satisfactory standard of living.

"In the matter of yield of crops per acre, the point of diminishing returns is reached on a considerable proportion of farms. Profits increase as yields increase until the yields are considerably above the average for the locality, but beyond this increased yields are obtained at the expense of farm profits.

"In quantity of product per dairy cow, the point of diminishing returns is not reached in ordinary farm practice. Hence, on dairy farms, quantity of product per cow is, on the average, a more important factor of success in farming than yield of crops per acre.

"It is both easier and more profitable to increase low acre yields than high ones, and a small product per cow than a large one. In other words, profits can be increased most easily by attention to the weakest points in a system of farming. The more vital the weakness the greater the increase in profits that can easily be made.

"With a given type of farming, under given conditions, there is a certain way of dividing acreage among the several enterprises of the farm which is more profitable than any other way; that is, there is a most profitable acreage for each crop. Similarly there is a most profitable proportion of income from each source. If the acreage of any crop or the proportion of income from any enterprise be greater or less than this optimum, the profits of the farm as a whole are lowered thereby.

"Certain enterprises may be distinctly profitable when occupying a minor position in the farm business and distinctly unprofitable if made major enterprises. This appears to be true of fruit growing in Chester County, and, to a less extent, of poultry keeping.

"On small farms the expense of operation is much greater per unit of product than on large farms of simialr type. Diversity of the farm business is, as a rule, an important factor of success in farming. A medium degree of diversity, sufficient to give good seasonal distribution of labor, complete utilization of land, and a considerable variety of sale products, is better than either extreme diversity or a low degree of diversity."

The discussion of these points is amplified by a large number of statistical tables.

A study of the tenant systems of farming in the Yazoo-Mississippi Delta, E. A. Boeger and E. A. Goldenweiser (*U. S. Dept. Agr. Bul. 337 (1916), pp. 18, figs. 5.*—The principal facts brought out by this investigation, based on 878 records in this region in 1913, may be stated as follows:

The share-cropping system is the safest for the tenant. The share renter fails more frequently to make even a bare living, but has a better chance to make a good income than has the share cropper. The cash renter runs still greater risk of failure, but has the greatest opportunity of making a labor income of not less than $1,000.

Fom the point of view of the landlord the situation is reversed. He is assured of a return of between 6 and 7 per cent on his investment where the land is operated by cash renters. Where the land is worked by share croppers or share renters the landlord's rate of interest often falls below 6 per cent, but

when the yield is good and the tenant makes a good return the rate of interest sometimes rises to more than three times that amount.

The principal factor in determining the amount of the tenant's labor income and the rate of the landlord's profits in this region is the yield of cotton per acre. The relationship between yield of cotton and labor income, however, is much closer on cash renters' farms than on those of share croppers, while the effect of yield on the landlord's profits is more apparent under the share cropping than under the share renting or the cash renting system. The tenant's incentive for securing a good crop is consequently greater among those who rent for cash, but on the other hand, the landlord is more directly interested in the magnitude of the yield per acre on the land of his share croppers.

Federal land grants to the States, with special reference to Minnesota, M. N. ORFIELD (*Univ. Minn., Studies Soc. Sci., No. 2 (1915), pp. V+275*).—This volume begins with a discussion of the land grants of the early New England colonies and traces the movement up to the present time. The larger part of the volume, however, is devoted to the administration of the public lands in Minnesota. An extensive bibliography is appended.

Reorganization of agricultural lands in Bavaria, SCHREINER (*Landw. Jahrb. Bayern, 4 (1914), No. 1, pp. 50–84*).—There is discussed in this article the present distribution of the agricultural lands and its influence upon the agriculture, the necessity for a further reorganization, the cost of redistributing, and its presumable influence upon the agriculture and social life of the community.

Land settlement after the war, C. TURNOR (*Jour. Farmers' Club [London], 1915, Dec., pp. 102–108*).—The author states that the British Empire embraces one-fourth of the land surface of the globe, yet the white agricultural population of the whole Empire, that is to say all the men and women living on or by the land, amounts to only 13,400,000, while Germany has an agricultural population of over 20,000,000. In conclusion he points out that since the Empire stands in such great need of agriculturists, the Government should take the necessary measures to induce a larger proportion of the rising generation to go in for a career on the land, and in cooperation with the Dominion governments devise a great system of settlement to achieve this end.

Population—a study in Malthusianism, W. S. THOMPSON (*New York: Author, 1915, pp. 217*).—The author states that he does not agree with the commonly accepted interpretation of the Malthusian theory. He claims that Malthus laid down three propositions: "(1) Population is necessarily limited by the means of subsistence; (2) population invariably increases where the means of subsistence increase, unless prevented by some very powerful and obvious checks; and (3) these checks, and the checks which repress the superior power of population, and keep its effects on a level with the means of subsistence, are all resolvable into moral restraint, vice, and misery."

From the author's study of the food supply in its relation to the population in the United States and a number of important European countries, he concludes that Malthus was essentially correct in his statement of the law of population. In the individual countries the population increases as the food increases. For a majority of the people of the western world the pressure upon the means of subsistence is the determining factor in the size of the family.

Another conclusion is that the population can not continue to increase at its present rate without being more and more subjected to the actual want of food, provided the distribution of labor between agriculture and the nonagricultural industries continues in its present trend, nor can a greater and greater proportion of the population be devoted to agriculture and the present rate of increase continue without checking the progressive standard of living. Therefore, either our present standard of living must be simplified as an in-

creasing proportion of the population becomes rural or the present rate of increase of population must be lowered.

Land credits.—A plea for the American farmer, D. T. MORGAN (*New York: Thomas Y. Crowell Co., 1915, pp. XVI+299*).—The author discusses the different bills submitted to Congress relating to agricultural credit, indicating their points of agreement and disagreement, and gives abstracts from comments of Members of Congress relative to the rural-credit system needed in the United States. He also outlines the type of credit institution he considers essential for the proper development of American agriculture.

Agricultural commerce, G. G. HUEBNER (*New York and London: D. Appleton and Co., 1915, pp. XIV+406, figs. 47*).—This book is designed to serve as a text-book for colleges and universities. It points out the organization of American commerce in agricultural commodities, and contains chapters on the following topics: Classification of agricultural markets and marketing processes; the country grain elevator and warehouse system—the local grain market; primary and seaboard grain markets—the terminal-elevator system; the local cotton market; central cotton markets—the distribution of cotton; relations between speculative exchanges and the sale of farm produce; the local market for live stock; central live-stock markets; the wool market; the leaf-tobacco trade; the marketing of fruit; the commercial inspection and grading of agricultural staples; collection and dissemination of crop reports; the insurance of agricultural commodities; the financing of crops; prices of agricultural commodities; and foreign markets and market influences.

The producers' marketing guide, G. C. TARMAN and L. LEER (*New Paris, Ind.: Producers' Marketing Guide Co., 1915, pp. 53, figs. 19*).—This pamphlet was written to advise country producers how to market their produce direct, and relates to methods that may be employed in packing and shipping eggs, butter, poultry, fruit, vegetables, and miscellaneous farm produce. It also contains the parcel-post regulations and form letters, cards, and labels to be used in conducting the business direct.

Cotton trade guide and student's manual, T. S. MILLER ([*Austin, Tex.: E. L. Steck*], *1915, pp. IX+431, pls. 18, fig. 1*).—The author has written this book primarily for the use of classes in agricultural colleges. It contains a definition of terms used in the cotton trade, methods used in grading, methods for estimating the cost of the different factors in the distribution of cotton, explanation of the quotations used on the different cotton exchanges, and how comparisons can be made, and the function of the cotton exchange. A brief history of cotton is included. In connection with most of the chapters a series of questions and problems relating to their contents is given.

Live-stock statistics (*Internat. Inst. Agr.* [*Rome*], *Bul. Agr. and Com. Statis., 6 (1915), No. 11, pp. 618, 619*).—Live-stock statistics are given showing the number of the different classes for the native States of British India for the crop seasons 1912–13 and 1913–14, and for Tunis, the number on December 31, 1913, and on July 31, 1915.

Monthly crop report (*U. S. Dept. Agr., Mo. Crop Rpt., 1 (1915), No. 8, pp. 77–92, figs. 2*).—This number gives the usual monthly estimates of the farm value of the more important agricultural products, and the range of prices at important markets, with detailed crop statistics for 1913, 1914, and 1915, estimates of the prices of articles purchased by farmers, and miscellaneous data concerning cucumbers grown for manufacture in Michigan, the acreage and production of dry beans, the production of cranberries, ocean freight rates, the production of tobacco by types and districts, and the condition of early southern truck crops.

The total value of the crop production in the United States in 1915 is estimated as about $6,471,000,000, as compared with $5,929,000,000 in 1914. The estimated value of animal products for 1915 is $3,849,000,000, as compared with $3,783,000,000 for 1914, and of forest products about $195,000,000 for both years.

The returns from the crop reporters indicate that in 1915 the hay crop consisted of 22.3 per cent timothy, 21.9 per cent timothy and clover mixed, 14.7 per cent clover alone, and 21.8 per cent alfalfa, the remainder being made up of miscellaneous grasses and hay.

A special inquiry concerning the extent of damage to corn, owing to frost, the past season and in a usual year, was sent to all of the North Central States, including the principal part of the so-called corn belt. The averages for 10 States indicate that 51 per cent was fully matured. 29 per cent in the dough stage, 15 per cent in the milk stage, and 5 per cent before the milk stage. Only 66 per cent was fit to husk and 29 per cent fit for seed, which resulted in a 24 per cent loss in yield and a 36 per cent loss in quality. Two charts are included showing the percentage of corn matured at the time of the killing frost in 1915 and in a usual year.

The preliminary returns for sugar made from beets are included, indicating that the amount of sugar made in 67 factories was 862,000 tons in 1915 as compared with 722,054 tons in 1914. The area harvested was 624,000 acres and 483,400 acres, respectively, and quantity of beets worked 6,462,000 and 5,288,500, respectively.

An inquiry as to the different kinds of corn produced shows that 42.9 per cent of the corn was white, 42.6 yellow, and 14.5 mixed.

A special inquiry shows that for every $100 worth of produce sold from the farm about $12.60 is sold in October, the month of heaviest total sales, $11.70 in November, $10.50 in December, and $10.10 in September, the smallest sales being made in May and June. The sales of crops alone are even more concentrated in the fall months; for every $100 worth of crops sold in a year, $22.80 worth are sold in October, $19.70 in November, and $10.20 each in September and December. The sales of live-stock products are fairly evenly distributed throughout the year.

Statistical tables relating to British self-governing dominions, colonies, possessions, and protectorates, 1912 (*Bd. Trade [Gt. Brit.], Statis. Tables Brit. Self-Gov. Dominions, Colonies [etc.], 1912, pt. 37, pp. 856*).—This annual report contains statistical data regarding the area and production of agricultural produce, number of live stock, imports, and exports for the British colonies and possessions for 1912.

[Agricultural statistics of Hungary] (*Ungar. Statis. Jahrb., n. ser., 20 (1912), pp. 87–162*).—In these pages are given data showing the number and area of farms by sizes for 1895 and the land classified according to its different agricultural uses for 1895 and 1912. For 1912 are also given the prices for agricultural produce, number of agricultural schools and attendance, area and production of crops, number of live stock by sizes of farms, and receipts of live stock and produce at the principal markets.

Farmers' National Congress of the United States (*Farmers' Nat. Cong. U. S., Proc., 34 (1914), pp. 202, pls. 12*).—The official proceedings for 1914 contain copies of the constitution and by-laws and a number of addresses relating to cooperation, marketing, and various phases of the country-life movement.

AGRICULTURAL EDUCATION.

The growth and possibilities of agricultural education in New England, J. L. Hills (*Mass. Collegian, 26 (1915), No. 7, pp. 8–11*).—In this address, given at the dedication of Stockbridge Hall at the Massachusetts Agricultural

College, October 29, 1915, the author reviews the early days of agricultural education in New England and discusses its present promising status and future.

Stockbridge Hall and Levi Stockbridge, W. H. Bowker (*Mass. Collegian, 26 (1915), No. 7, pp. 5–8, figs. 5*).—This address, made at the dedication of Stockbridge Hall at the Massachusetts Agricultural College, October 29, 1915, contains historical data on the college.

The Winthrop Farm School, Hetty S. Brown (*Jour. Home Econ., 7 (1915), No. 9, pp. 480–484, figs. 2*).—A description is given of the work in vegetable gardening, cooking, and sewing at this experimental rural school, which was opened in the spring of 1911 at the Winthrop Normal and Industrial College, Rock Hill, S. C. Except for the first four months, the college has supplied all the funds for maintaining the school.

[Agricultural instruction in Ontario] (*Rpt. Min. Agr. Ontario, 1914, pp. 1–23, 45–62, figs. 23*).—This review of the work of the department of agriculture includes a report on the expenditures under the agricultural instruction act, the Ontario Agricultural College and its work in promoting agricultural instruction in rural schools, the Ontario Veterinary College, farmers' institutes, rural school fairs conducted by district representatives, which increased from 25 fairs in 1912, the first year, to 148 fairs held in 37 counties and including the children in 1,391 schools in 1914, and courses in agriculture for farmers' sons, also conducted by district representatives. These courses were begun in Victoria County in 1908 with 6 students and have increased to 30 courses with a total attendance of 555. In the majority of cases the boys taking this course have organized themselves into what is known as a "Junior Farmers' Improvement Association."

Summer schools for teachers (*Agr. Gaz. Canada, 2 (1915), No. 10, pp. 992–1001*).—The work of the summer schools for teachers in the Provinces of Prince Edward Island, Nova Scotia, New Brunswick, Quebec, Ontario, Manitoba, Saskatchewan, Alberta, and British Columbia is briefly described.

Work of the women's institutes (*Agr. Gaz. Canada, 2 (1915), No. 9, pp. 846–860, figs. 6*).—Brief reports are given on the work of women's institutes in the various Provinces of Canada.

[Agricultural instruction in Sweden] (*Malmö. Läns Hushäll. Sällsk. Kvrtlsskr., 1915, No. 2, pp. 230–252, 283–285, 296–298*).—This is a report on the progress made in instruction in agricultural continuation schools, the people's high school at Östra Grevie, which has added a one-year agricultural course corresponding to that of a farm school, and the dairy school for women at Alnarp, agricultural courses for elementary school-teachers, and training courses for teachers in agricultural continuation schools.

Report of the agricultural society of Malmöhus Province for 1914 (*Malmö. Läns Hushäll. Sällsk. Kvrtlsskr., 1914, No. 4, pp. VIII+489–936, figs. 4*).—Reports are given on the activities of the farm schools at Hvilan, Fridhem, and Skurup, the agricultural school at Dala, the agricultural housekeeeping schools at Fridhem and Östra Grefvie, the dairy school at Näsbygård, the dairy school for women at Alnarp, the Fredrika-Bremer Society Fruit Culture School at Apelryd (formerly Småryd) near Båstad, special courses in agriculture and home economics for adults and teachers, the seed-control station at Lund, the chemical station at Alnarp, swine-breeding stations, etc.

Nature study and agriculture in relation to educational motives and purposes, H. N. Goddard (*School Sci. and Math., 15 (1915), No. 7, pp. 606–613*).—In this discussion the author endeavors to show the place of nature study and agriculture in the curriculum. He holds that nature study has its large place in the earlier grades, where it should be a generalized study of the child's

natural surroundings. The desire to do something for a practical result grows rapidly and leads the pupil to give eager response to the industrial arts. At the beginning of the seventh grade agriculture makes a most valuable subject for such treatment. The work has a prevocational value in the upper grades and this gradually changes into a more strictly vocational value in the later years of the high school, where the work should still be treated as an industrial art or vocational subject linked up with and strengthened by the general studies of the high school, especially the sciences. There should be definite instruction work, but this should be linked up with and motivated by the practical doing of suitable school and home projects related to the farm.

What is involved in vocational education, E. DAVENPORT (*Univ. Ill. Bul. 12 (1915), No. 19, pp. 23*).—The author quotes certain fundamental propositions of the so-called unit system recommended by the Illinois Educational Commission in 1911; outlines the provisions of the Cooley bill for establishing a system of vocational schools for Illinois; discusses the effect of a separate system of vocational schools upon the children, the existing public schools, and society, the financial waste of a multiple system of schools, and the experience of agricultural and mechanical colleges in dealing with the same kind of problem; and points out the advantages of the dual system, weak points in the public-school administration, and suggests propositions for agreement.

Studies in elementary agriculture, S. W. CUNNINGHAM (*Fresno [Cal.] State Normal School Bul. 2 (1915), pp. 63, figs. 48*).—This bulletin presents 88 studies in soils and plants, outlining the apparatus, materials, and methods of procedure which constitute part of the laboratory course given in the Fresno, Cal., State Normal School in preparing students to teach agriculture in the rural schools. A list of special apparatus for the rural school is included.

The principles of agronomy, F. S. HARRIS and G. STEWART (*New York: The Macmillan Co., 1915, pp. XVI+451, pl. 1, figs. 97*).—This text on crop production is one of the Rural Textbook Series. While written primarily for high schools, giving more than one course in agriculture and for short courses in agricultural colleges, it should also be useful to the practical farmer. It deals with the principles of plant growth; the soil and its management; field crops; and problems of field management, including the planning and equipment of the farm, what crops to grow, and factors of success in crop production.

Laboratory manual of cereals and forage crops, G. LIVINGSTON and F. W. STEMPLE (*Columbus, Ohio: R. G. Adams & Co., 1915, pp. 147, figs. 2*).—This laboratory manual contains 59 exercises, a large number of which have been used during the past four years in connection with the regular cereal and forage-crop courses at the Ohio State University. The exercises include a botanical study of the plants, laboratory and field studies of varieties, judging, scoring, germination tests, etc. More than one laboratory period of two hours a week will be required to complete all the exercises, but when no more time is available only the more important exercises may be selected for study.

Agricultural drawing and the design of farm structures, T. E. FRENCH and F. W. IVES (*New York and London: McGraw-Hill Book Co., Inc., 1915, pp. VIII+130, figs. 182*).—This book is intended primarily for students in agriculture and agricultural engineering, but also is of interest to farmers. Chapters are devoted to the theory and technique of drawing, working drawings, farm structures, maps and topographical drawing, pictorial drawing, construction data, and a selected bibliography. A variety of problems are included.

Supplementary problems for classes in agriculture (*Manila, P. I.: Bur. Ed., 1915, pp. 94*).—This is a compilation of arithmetical farm problems including fractions, decimals, bills and accounts, measures, percentage, ratio and

proportion, lines, surfaces, and volumes, and special crops and farm activities, for the classes in agriculture in grades 6 and 7 of the Philippine public schools.

Chemistry of common things, R. B. BROWNLEE, W. J. HANCOCK, R. W. FULLER, and J. E. WHITSIT (*Boston: Allyn and Bacon, 1914, pp. VIII+616, pl. 1, figs. 186*).—This book endeavors to meet the growing demand that high-school courses should prepare the pupil for citizenship. Part 1 deals with fundamental ideas and principles, and part 2 supplies additional material adapted to the special needs of industrial, technical, agricultural (including a study of the essential elements of plant life, soils, sources of nitrogen and phosphorus, and constituents of staple crops), and domestic science (including a study of cooking, the adulteration of foods, bread making, milk, cream, ice cream, butter and cheese, and cleaning and laundering) courses. The wide range of topics treated enables the teacher to select a course suited to the requirements of his community.

Nature study, geography, and agriculture (*Dept. Ed. Tex. Bul. 46* (*1915*), *pp. 51–59, 104–108, 111–113, 121, 123*).—This manual includes outlines of a continuous course in nature study, geography, and agriculture throughout 7 grades of the elementary schools, work in general agriculture, animal husbandry, soils and crops, and horticulture and farm management, respectively, for the 4 years of the high-school course with one credit for each year's work, a 4-year high-school course in domestic science and art with one-half credit for each year's work, and a list of reference books.

Nature study and agriculture, MARGARET M. HEALEY and H. A. FARRAR (In *Material for Teachers' Manual. Montpelier, Vt.: Dept. Ed., 1914, pp. 195–220*).—This is an outline of instruction in agriculture for grades 1 to 8, inclusive, designed to furnish to Vermont teachers a basis for systematic work.

Nature study lessons for teachers and students, G. A. CORNISH (*Toronto, Can.: Dominion Book Co., 1914, pp. XVI+96, figs. 13*).—This is a compilation of bird poems and 31 lessons for the study of typical individual birds and such general topics as bird food, beaks, eggs, and migration. Each lesson consists of observations made by pupils and complete statements, for the use of the teacher, of the facts to be observed by the pupils.

Eighth grade bulletin containing outline schedules for manual training and home economics, plan for home project work, and rules governing eighth grade examinations (*Wash.* (*State*) *Dept. Ed. Circ. 12* (*1915*), *pp. 8*).

Home makers course, MARY L. WATKINS (*Col. Indus. Arts Tex. Bul. 48* (*1914*), *pp. 32*).—This is an outline of a nontechnical and practical course of study prepared for the Texas Congress of Mothers and Parent-Teachers' Association by the secretary of the association, assisted by the department of extension of the College of Industrial Arts, Denton, Tex. The course is arranged under the following topics, to each of which a bibliography is appended: (1) The house, its plan and decoration, (2) household sanitation, (3) science of the household, (4) household administration, (5) study of foods, (6) marketing and care of food in the home, (7) textiles and clothing, (8) personal hygiene and home care of the sick, and (9) child study and some of its problems.

[Suggestive outlines for club study] (*Iowa State Col. Agr. Ext. Dept., Home Econ. Circ., 1915–16, Nos. 1, pp. 9; 2, pp. 6; 3, pp. 16; 4, pp. 8*).—These circulars contain suggestive outlines as guides for women's clubs in the study of foods, the child, the house, and American industries, respectively.

Club work in Indiana, J. D. HARPER (*Purdue Univ., Dept. Agr. Ext. Bul. 42* (*1915*), *pp. 16, figs. 11*).—This bulletin gives an account of the organization, aims, methods, and results of club work in Indiana.

NOTES.

California University.—A total of 9,198 students were registered for correspondence courses in agriculture for the year ended April 30, 1915, which with previous enrollments brought the total number to 18,347. One or more courses have been completed by 2,832 students.

Of the students enrolled this year, 33 per cent are actually engaged in farming, 12 per cent are housewives, 2 per cent engineers, 16 per cent business men, 3 per cent teachers, 15 per cent clerks, stenographers, and bookkeepers, and 4 per cent students. The average age is estimated to be 33 years, ranging from 10 to 85 years. Students have enrolled from 42 other States, the District of Columbia, Alaska, Hawaii, the Philippines, Porto Rico, Canada, the Fiji Islands, Greece, India, Mexico, Africa, England, and various small islands of the West Indies.

Georgia College.—Beginning next fall a degree course in veterinary medicine is to be offered in charge of Dr. W. M. Burson.

Guy R. Jones and Elmo Ragsdale have been added to the extension staff, the former as field agent in agricultural engineering, and the latter for horticultural work, especially with canning clubs.

Maine University and Station.—Glen Blaine Ramsey was transferred March 15 from instructor in biology in the university to assistant plant pathologist in the station. J. E. Sullivan has been appointed farm superintendent at the Aroostook farm, vice Guy A. Baker resigned, beginning April 1.

Massachusetts College.—S. B. Haskell has resigned as professor of agronomy to engage in commercial work, and Miss Beryl H. Paige as assistant in veterinary science in the station. Recent appointments in the extension division include E. Farnum Damon as extension professor of agricultural economics, and F. A. C. Smith, previously instructor in landscape design at the University of Illinois, as extension instructor in civic improvement.

Nevada Station.—Work has been begun on a serum laboratory building to cost about $1,500.

New Mexico College and Station.—Dr. E. P. Humbert resigned as dean of agriculture and agronomist January 1 to become plant breeder in cotton investigations at the Texas Station, and has been succeeded by Rupert L. Stewart. A. Z. Smith was appointed assistant agronomist and R. B. Thompson assistant poultryman, each beginning February 1.

New York State Station.—Recent appointments to the board of control include Frank M. Bradley, of Barkers; Charles C. Sackett, of Canandaigua; and Alfred G. Lewis, of Geneva, succeeding Burt E. Smalley, H. C. Harpending, and C. Willard Rice. State Commissioner of Agriculture Charles S. Wilson has been elected president of the board.

Washington College and Station.—Elton Fulmer, head of the department of chemistry since 1893, state chemist since 1900, and dean of the faculty since 1908, was killed in a railway accident February 20. Professor Fulmer was 51 years of age, and a graduate of the University of Nebraska (B. S. 1887 and M. A. 1889). He was instructor in chemistry in the same institution from 1888 to 1893, when he became professor of chemistry and chemist in the Washington College and Station.

THE AGRICULTURAL EXPERI TIONS OF THE UNI ED STATES.

U. S. DEPARTMENT OF AGRICULTURE
STATES RELATIONS SERVICE
A. C. TRUE, DIRECTOR

Vol. XXXIV MAY, 1916 No. 7

EXPERIMENT STATION RECORD

WASHINGTON
GOVERNMENT PRINTING OFFICE
1916

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EXPERIMENT STATION RECORD.

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FORESTRY.

DISEASES OF PLANTS.

ANIMAL PRODUCTION.

DAIRY FARMING—DAIRYING.

LIST OF EXPERIMENT STATION AND DEPARTMENT PUBLICATIONS REVIEWED.

[a] Printed in scientific and technical publications outside the Department.

EXPERIMENT STATION RECORD.

Vol. XXXIV. May, 1916. No. 7.

The establishment of a Division of Agricultural Meteorology in the U. S. Weather Bureau is a matter of special importance, as marking a new step in agricultural investigation. It makes provision for a type of study which has long been advocated and under consideration by the Weather Bureau, and it definitely recognizes a field of investigation looking to the correlation of meteorological and plant growth factors.

The fact that it is planned to conduct most of this work in close cooperation with the experiment stations brings the latter prominently into the new undertaking, and gives to it a national scope and interest. The selection as head of the new division of Prof. J. Warren Smith, for several years section director of the Weather Bureau at Columbus, Ohio, and a student in this special field, insures for it sympathetic and capable leadership.

Heretofore the chief effort of the weather service in relation to aiding agriculture has been directed toward the prevention of crop losses by timely warnings of adverse conditions. For more than twenty years the Weather Bureau has been publishing weekly and monthly weather and crop bulletins, and has been conducting certain special services in the interests of agricultural production. Its efforts in the latter direction have covered quite a wide range. Among them are the distribution of frost warnings in fruit growing and trucking regions, studies on the occurrence and distribution of frosts in mountain regions, with particular reference to the location of orchards, and warnings of adverse weather conditions in the great corn, wheat, cotton, tobacco, sugar, rice, and truck growing regions. It has also made measurements of snow in the western mountain States as a basis for predicting the probable water supply for irrigation, and has distributed information regarding pasture conditions on the ranges with a view to bringing about a favorable distribution of cattle.

Although these services have not been designated as agricultural meteorology they properly fall under that head, and it is expected that they will be continued by the new division. As more detailed information is gained upon the effects of temperature, rainfall, and

sunshine on plant development, this knowledge will be utilized in making the daily, weekly, and monthly bulletins of greater value.

But in addition to these efforts in the application of meteorology to the needs and interests of agriculture, more intimate and systematic studies are now to be inaugurated upon the relation of the environmental factors embraced in climate to the growth of plants and the production of crops. These studies will relate not only to the limiting factors of the season as affecting the application of special crops or varieties to a region, but to the effect of weather and climate upon the factors of plant growth. The latter studies will for the present take the form especially of investigation of the critical periods in the development of plant life.

It is planned to conduct these studies by two general methods: In the first method the crop yields will be correlated with the weather conditions that have prevailed during a long period of years, by means of charts and correlation tables. The other method contemplates a systematic record of the temperature, rainfall, sunshine, and evaporation, taken in connection with observations upon the development of certain agricultural plants, the time at which definite stages of growth are reached, etc. In other words, the attempt will be made to determine by direct experiments the critical periods of growth and the effect upon them of varying meteorological factors, as well as the susceptibility or response of the plants at these different periods.

This type of studies is especially planned to be carried on in close cooperation with the agricultural experiment stations. To that end the Weather Bureau is soliciting the cooperation of the stations, inviting suggestions as to the plan as a whole, special methods to be followed, kind of data to be taken, etc. It is aimed to make the cooperation a real one in every sense, pertaining to the development of the plan and methods as well as to the field observations and the handling of the results.

This is a matter in which the experiment stations are in position to render very material assistance. They have fields for experiment with agricultural crops, and can provide the proper conditions for experiment and for the accurate recording of data. The field of inquiry is one which naturally interests them, and there will be marked advantage from the provision of a central agency to give unity and continuity to such studies distributed over the country. It is to be hoped, therefore, in the interest of the new undertaking, that there will be quite general response to the proposal for cooperation.

Other branches of this Department, notably the Bureau of Plant Industry, have been for some time conducting studies relative to the water requirement of crops, drought resistance, and the effect of various environmental factors on plant growth. These have a direct

bearing on the general problem which the Weather Bureau is now addressing itself to, and cooperation will be sought in extending the inquiries and in applying the results.

It is the desire of the new division to get track of the various types of study in this country bearing on the correlation of climate and plant growth. One of its early aims will doubtless be to make a survey of such investigation, to ascertain the status of the inquiry in this field, and to study the methods employed with a view to determining those best adapted to the purpose of the proposed investigations. There has been an increasing amount of such study, scattered over the country, and it gives much encouragement for a more systematic undertaking.

For example Voorhees, of Tennessee, has been able so to correlate climatic conditions, as shown by ordinary meteorological observations, with crop requirements as to arrange a double cropping system which utilizes the rainfall and temperature of that State to much better advantage in crop production than has been done under general practice. Blair has worked out some interesting correlations between temperature and rainfall and spring wheat in the Northwest, which may prove of practical value in predicting probable wheat yield. Wallis has attempted a broad correlation of rainfall and agriculture in the United States, Kinzer of weather and cotton in Texas, and McLean of climate and plant growth in Maryland. Prof. J. Warren Smith has reported a series of studies of the effect of weather (more particularly temperature and rainfall) on yield of wheat and potatoes in Ohio, and on the yield of corn in the main corn growing districts of the United States. These studies have had in mind especially the critical periods and limiting meteorological factors in crop growth. Dr. O. L. Fassig is studying the period of safe plant growth in different parts of Maryland.

The inadequacy of present methods and data for quantitative studies of the climatic relations of crops has been pointed out by various investigators who have attempted to use the data in such studies. For example, Prof. B. E. Livingston, in referring to the systematic collection of observations upon the various climatic areas, used largely for weather prediction and for the purposes of theoretical meteorology, suggests that "quantitative climatic descriptions must lie hidden somehow in these enormous masses of figures, but the plant geographer, whether agriculturist or ecologist, has thus far been able to derive therefrom but a very small amount of applicable information."

Nevertheless the data are being used to an increasing extent by a number of investigators, including Livingston, in working out valuable climate and crop correlations.

The action of the U. S. Weather Bureau in establishing its new division is in line with recent agitation and development in other countries. It is but one of many recent evidences of growing interest and progress in the development of studies and investigations which may be considered as belonging strictly in the field of agricultural meteorology, and this progress has occurred in spite of the fact that systematic organization of such work has undoubtedly been greatly impeded by the European war.

Much was expected with respect to suggestive plans and methods for modifying existing weather services, to make their work more useful to agriculture, from the deliberations of the permanent commission on the organization of agricultural meteorology, appointed by the International Meteorological Commission in 1913. This commission included in its membership distinguished representatives of France, Germany, Russia, Italy, and Canada. It was not able to go farther than to make certain general recommendations regarding the improvement of the present weather services from the agricultural standpoint, such as simplification of apparatus for more general use, systematic observations on sunshine and state of the sky, wider distribution of forecasts, increase of local forecast stations, and the use of weather charts in the primary schools.

The European situation which developed soon after the appointment of this commission naturally precluded, for the time being, the possibility of any further outcome from this source. Nevertheless, the subject has received steadily increasing attention by individual countries and investigators. In line with the general suggestions of the commission, steps have been taken to make the weather services of Great Britain, France, Germany, Sweden, Brazil, and other countries more directly useful to farmers.

The development of the British Meteorological Service with this object in view has been more particularly along the line of supplying information likely to be of value to agriculturists, in the form of weather forecasts (including special harvest forecasts) and statistical reports, leaving the application of the data to the problems in hand to anyone disposed to take advantage of the information provided. It has been pointed out that the fundamental difficulty with the British program seems to be that "the farmer has made his own study of the weather and uses it in his own way without committing the results to writing, while the Meteorological Office prints large masses of data without knowing precisely in what direction to discuss them in relation to agricultural problems." Recognizing this difficulty, the British Service is studying the trend of inquiries about the weather on the part of the general public, with a view to approaching agricultural meteorology on lines suggested

by the agriculturists themselves. Much importance is also attached to the teaching of the subject of meteorology in the rural schools.

Russia was the pioneer and is still the preeminent leader in the organization of systematic investigations designed to determine quantitatively the relation of different climatic factors to crop production. The Russian service, organized as a branch of the Ministry of Agriculture in 1897, has become so extensive and has been in operation so long that it is now contributing a voluminous literature on the more important phases of agricultural meteorology. This service attempts the direct and quantitative correlation of meteorological conditions with plant growth by means of a comprehensive system of experimental and observation fields, arranged for different kinds and classes of crops.

The work in Russia is furnishing a large amount of most valuable exact information as to the climatic adaptations of plants, and their critical periods and requirements as regards meteorological conditions, especially temperature and precipitation. In addition to the making of these more direct studies, the data of ordinary meteorological observations are being compiled in form to show periods of growth of different crops and regions, and probable occurrence and distribution of droughts. This is proving of great practical value in determining the crops and the cropping systems most likely to succeed in any given locality.

The Russian experience and results are especially valuable, not only in outlining the problems which must be solved, but in indicating the lines and methods of attack. For some time to come the question of methods applicable to conditions in the United States will probably occupy a major share of attention of those attempting to develop this field of inquiry. The Russian plan is remarkably comprehensive and complete, but it is not reasonable to assume that it can be profitably adopted in its entirety in this country. A modification of the plan, adapted especially to the study of the relation of meteorological conditions to the growth of spring wheat, has been introduced into Canada. The work was begun in 1915, when fourteen experimental and observation stations, well distributed over Canada, were established, but the work has not yet been so thoroughly organized or proceeded far enough to warrant definite conclusions as to the value of the method or the significance of the results obtained.

The Russian plan includes the study of the relation of meteorological conditions to animal production as well as to plant production, and quite possibly one of the important lines along which such work may develop in this country is the more exact study of the relation of weather and climate to insects and fungus pests, particularly as a good beginning has already been made in such studies by several

American investigators. The opportunities in this direction seem very attractive.

In a previous editorial discussion of this subject, it was stated that the fundamental needs as regards the application of meteorology to agriculture are in logical sequence and ascending order of importance as follows: (1) The organization and correlation of statistical data on weather conditions and crop growth already available in large amount; (2) the organization of more extensive and systematic effort to secure exact data along this line by all interested agencies; and (3) special studies of the adjustment of plants and animals to their atmospheric environment, requiring the cooperation of the biologist with the meteorologist. The record of recent meteorological work shows that there has been some distinct progress along all of these lines.

The outlook for further progress is hopeful; the need of it is evident. It should be recognized, however, that this is a special line of study and requires for its highest success a broad system of cooperation. There has been lacking in the past a center around which to group such a cooperative enterprise, and the meeting of this deficiency by the establishment of the new division in the Weather Bureau encourages the hope that investigation in this field will be greatly stimulated and strengthened.

The fact that such studies must almost of necessity be cooperative, since they must be made on a large scale and in accordance with a systematic plan which will enable the results to be brought together and correlated, and furthermore that they must extend over a considerable range of country and be continued through a period of years, all points to the need of an extensive and permanent system. In these respects the conditions in this country seem especially happy and propitious, and to offer opportunity for the joining of hands by the National Weather Bureau and the State experiment stations in a study where their fields and their interests meet. In these two agencies facilities are afforded for profitable investigation hardly to be found in equal scope and variety of conditions in any other country in the world.

RECENT WORK IN AGRICULTURAL SCIENCE.

AGRICULTURAL CHEMISTRY—AGROTECHNY.

Physiological chemistry, A. P. MATHEWS (*New York: William Wood & Co., 1915, pp. VIII+1040, pl. 1, figs. 78*).—This text is divided into three parts: (1) The chemistry of protoplasm and the cell; (2) the mammalian body considered as a machine, and its growth, maintenance, energy transformations, and waste substances; and (3) practical work and methods. The text is illustrated with many figures and contains at the end of each chapter a short list of references to original work bearing on the subject dealt with.

Biochemical hand lexicon, edited by E. ABDERHALDEN (*Biochemisches Handlexikon. Berlin: J. Springer, 1915, vol. 9, Ergänzungsb. 2, pp. VI+415*).—A continuation of the work previously noted (E. S. R., 30, p. 707). The sections included in this volume are as follows: Proteins; peptones and kyrins; protein oxidation products; polypeptids; amino acids; nitrogenous derivatives of proteins of unknown constitution; urea and its derivatives; guanidin, creatin, and creatinin; amins; bases of unknown or uncertain constitution; cholin, betain, neurin, muscarin, etc.; indol and indol derivatives; nucleo proteins and nucleic acids; purin substances; and animal coloring matter.

Quantitative laws in biological chemistry, S. ARRHENIUS (*London: G. Bell & Sons, Ltd., 1915, pp. XII+164, figs. 36*).—The subject matter of this volume is based on three Tyndall lectures given at the Royal Institution in London in 1914. Biochemical phenomena are considered in the light of physical chemistry. The chapters include an introduction; the velocity of reactions; the influence of temperature on the velocity of reactions; reactions of cells; the quantitative laws of digestion and resorption; chemical equilibria; and immunization.

Oils of the coniferæ.—V, The leaf and twig, and bark oils of incense cedar, A. W. SCHORGER (*Jour. Indus. and Engin. Chem., 8 (1916), No. 1, pp. 22–24, fig. 1*).—The leaf and twig and the bark oils, respectively, of incense cedar are found to have approximately the following percentage composition: Furfurol trace, trace; 1-α-pinene from 12 to 16 and from 75 to 85 per cent; δ-sylvestrene and δ-limonene from 54 to 48 and ? per cent; dipentene ? and from 5 to 6 per cent; bornyl actetate 8 and 1 per cent; free borneol 4 and 2 per cent; "libocedrene" from 6 to 7 and ? per cent; "green oil" 2 and 3 per cent; losses 6 and 6 per cent.

See also a previous note (E. S. R., 33, p. 409).

Polymerization of Chinese wood oil, C. L. SCHUMANN (*Jour. Indus. and Engin. Chem., 8 (1916), No. 1, pp. 5–15, figs. 2*).—As the result of a comprehensive investigation the author concludes that the polymerization of Chinese wood oil takes place by the union of double bonds of the (wood oil) fatty acids, analogous to the polymerization occurring on heating linseed oil. The polymerization is "mesomorphic" and the intermediate product can be isolated.

A satisfactory method for the examination of wood oil may be based on the property of elaeomargaric acid to crystallize from a dilute alcohol solution.

The fatty acids from the polymerized triglycerids of the wood oil, as well as those from the other drying and semidrying oils, do not have this property.

Wood oil can be completely polymerized upon heating for a short time at very high temperatures. Under such treatment it will not gelatinize. The oil polymerizes considerably faster than linseed oil at corresponding temperatures. Lime, litharge, and oxidation products together with a large number of metals at higher temperatures catalyze the polymerization of the elaeomargaric acid triglycerid into the intermediate product. Oxygen does not act as a catalyzer except indirectly. The pure polymerized product of the oil dries very slowly. It is thus characterized, as containing large percentages of polymerized triglycerid, by this slow rate of drying.

The carbohydrates of pine wood, E. Hägglund (*Biochem. Ztschr., 70 (1915), No. 5-6, pp. 416-425*).—The composition of the carbohydrates of pine wood was determined qualitatively and approximately quantitatively. On hydrolysis they yielded chiefly xylose and mannose, together with some fructose and galactose. Glucose could not be found. On hydrolysis with dilute acids at higher temperatures the carbohydrates were first changed to a soluble form and on continued heating were partly converted to glucose.

An effective apparatus for evaporating aqueous extracts by means of a current of air, T. B. Aldrich (*Jour. Biol. Chem., 23 (1915), No. 1, pp. 255-259, pl. 1, fig. 1*).—An arrangement for the evaporation of solutions or the drying of biological materials which are susceptible to higher temperatures is described. The apparatus has given excellent results and the author claims certain advantages for its use over vacuum distillation.

A check valve for suction flasks, G. P. Walton (*Jour. Indus. and Engin. Chem., 8 (1916), No. 1, p. 57, fig. 1*).—A device which allows continuous filtration by suction in automatically emptying the flask is described in detail. It consists of a form of ball check valve, easily constructed and readily fitted to any of the usual types of suction flasks. The device as described has been found to be very convenient and a time saver in crude fiber, reducing sugar, pentosan, and other determinations where the filtrate and washings are rejected.

Note on the micromethod for gasometric determination of aliphatic amino nitrogen, D. D. Van Slyke (*Jour. Biol. Chem., 23 (1915), No. 1, pp. 407-409, fig. 1*).—By a slight modification of the gas burette in the apparatus previously noted (E. S. R., 31, p. 610) it is found possible to secure the same degree of accuracy of results by reducing the size of the apparatus one-half and using correspondingly small amounts of material for the determination.

The recovery of molybdic acid from phosphorus-determination residues, A. D. Berkhout (*Verslag. Landbouwk. Onderzoek. Rijkslandbouwproefstat. [Netherlands], No. 18 (1915), pp. 83-85*).—The following procedure is recommended for the recovery of molybdic acid from the residues obtained in the method of Grete (E. S. R., 22, p. 510):

Two and six-tenths kg. of the precipitate, which has been washed and air-dried, is dissolved in 2 liters of 25 per cent ammonium hydroxid and 4 liters of water. Four liters of magnesia mixture are added, and ammonium magnesium phosphate is precipitated after standing several days. This is filtered and washed with 2.5 per cent ammonium hydroxid. (The ammonium magnesium phosphate, dissolved in nitric acid, may be used to recover molybdic acid from the mother liquor of precipitates.) The clear filtrate is evaporated on the water bath to incipient precipitation of ammonium chlorid, several portions of 100 cc. each of 10 per cent ammonium hydroxid being added during the evaporation. The precipitated ammonium molybdate is transferred to a porcelain mortar, mixed, and

well stirred with water. It is then filtered and washed to remove as much as possible of the chlorids and dried at room temperature. The filtrate from this recovered product may be treated for a further recovery of ammonium molybdate, the impure product being purified by recrystallization from boiling water to which has been added some 10 per cent ammonium hydroxid.

A similar procedure for the recovery of molybdic acid from the residues of the Lorenz (E. S. R., 13, p. 14) and Pemberton methods is also outlined.

Examination of water for sanitary and technic purposes, H. LEFFMANN (*Philadelphia: P. Blakiston's Son & Co. [1915], 7. ed., rev. and enl., pp. XVI+140, figs. 6*).—The seventh edition of this work, revised and enlarged. The purpose of the volume, as stated in the preface, is to furnish the commercial and works-laboratory with a summary of the best processes for ascertaining the sanitary and technical value of a water sample. The procedures have been brought into general agreement with those recommended by the American Public Health Association.

Investigations on the acid and alkali content of soils, A. STUTZER and W. HAUPT (*Jour. Landw., 63 (1915), No. 1, pp. 33–45*).—The great influence of free acid in the soil on the crop and the soil bacteria, and also on the chemical changes produced in the soil, is pointed out. The method for soil acidity of Tacke and Süchting (E. S. R., 21, p. 9) was not found to be as satisfactory as reported by other workers.

For the qualitative determination of acidity in the soil the methods proposed by Baumann and Gully (E. S. R., 19, p. 1008), Loew (E. S. R., 21, p. 703), and Daikuhara (E. S. R., 31, p. 618) have been tested and found to be satisfactory. A quantitative method for the determination of acidity in soil, based on the qualitative test of Baumann and Gully, has been devised and is outlined in detail. Experimental results indicate the applicability of the method.

A method for the determination of water-soluble alkali, based on the same principle, is also described. The presence of carbonates does not necessarily indicate the absence of acids. A soil which requires more than 200 mg. of suphuric acid for neutralization per kilogram is considered strongly alkaline. From experimental data the authors conclude that it is impossible to determine the acidity of a soil by treatment with dilute alkali and therefore recommend the iodid-iodate method which they have devised.

A proposed rapid method for the analysis of limestone for agricultural processes, A. S. BEHRMAN (*Jour. Indus. and Engin. Chem., 8 (1916), No. 1, pp. 42–45*).—A tentative "differential" method for the agricultural analysis of limestone is proposed.

The procedure outlined is to dissolve the sample (1 gm.) in 50 cc. half-normal hydrochloric acid, add a few drops of 3 per cent hydrogen peroxid, and heat on the water bath at 86° C. for 30 minutes. The flask and contents are then cooled, 5 gm. of ammonium chlorid added, and the iron and aluminum precipitated with 25 cc. half-normal ammonium hydroxid. After standing for 15 minutes the precipitate is filtered and washed with a neutral 10 per cent solution of ammonium nitrate, ignited, and weighed. This weight represents the insoluble residue, plus iron and aluminum. The filtrate and washings are then titrated with standard half-normal hydrochloric acid, using methyl orange as an indicator. From the amount of hydrochloric acid used to put the carbonates in solution and from the total carbonates (original sample, minus insoluble residue and ammonia precipitate) the percentages of calcium and magnesium carbonates can be calculated by two simultaneous equations. The theory of the calculation is explained in detail.

From a series of comparative determinations with standard methods the proposed method was found to be well within the experimental error limit for insoluble residue and ammonia precipitate, while the percentages of calcium carbonate varied from 1.02 to 4.35. The author has demonstrated that the ammonia precipitations may be made quantitatively in the cold in the presence of ammonium salts, that half-normal hydrochloric acid may be heated under the proper conditions for 30 minutes without any loss of acid, and that ammonium chlorid exerts an inhibitory action upon the precipitation of calcium carbonate to a greater extent than is generally attributed to it. "If the limit of inaccuracy for agricultural analysis is set at 1 per cent, the proposed method, in its present state, at least, is hardly to be recommended, but where only an approximation is desired, it might be employed."

A rapid method for the determination of carbon dioxid, W. H. WAGGAMAN (*Jour. Indus. and Engin. Chem., 8 (1916), No. 1, p. 41, fig. 1*).—An apparatus for the determination of carbon dioxid which works automatically and requires very little attention from the manipulator is described in detail. It is similar to that described by Cameron and Breazeale (E. S. R., 15, p. 744). Experimental data submitted indicate the accuracy of the procedure. The method may be employed for the rapid estimation of carbon dioxid in the organic matter of soils and also in other organic compounds.

The estimation of carbon dioxid in the ash of plant and animal substances, S. B. KUZIRIAN (*Jour. Indus. and Engin. Chem., 8 (1916), No. 1, p. 89*).—For the determination of carbon dioxid in the crude ash of plant and animal material the author prefers the simple and more rapid procedure of Gooch and Kuzirian (E. S. R., 26, p. 708), using sodium paraphosphotungstate, which is stable and easily prepared, to the procedure outlined by Boltz (E. S. R., 34, p. 202). The carbon dioxid is determined by loss on ignition, and excellent results are said to be obtained.

Food analysis; typical methods and the interpretation of results, A. G. WOODMAN (*New York and London: McGraw-Hill Book Co., Inc., 1915, pp. X+510, figs. 108*).—As stated by the author, this book has grown out of the courses given to students in food analysis during the last few years. Great emphasis is laid on the interpretation of analytical results. The book has been written and the material selected primarily for the undergraduate student rather than for the practising chemist. Many references to standard works on food analysis are cited.

Concerning the identity of the proteins extracted from wheat flour by the usual solvents, C. H. BAILEY and M. J. BLISH (*Jour. Biol. Chem., 23 (1915), No. 1, pp. 345–357*).—From a study of the separation of the proteins in flour the authors conclude that the 1 per cent sodium chlorid extract of a patent flour contains a large proportion of gliadin, representing more than one-half of the total protein extracted. Extraction with 10 per cent sodium chlorid and 5 per cent potassium sulphate decreases the amount of gliadin extracted. More gliadin was extracted with 50 per cent alcohol than with either 30 or 70 per cent. None of the extractions were complete unless the temperature was raised.

Extraction with 50 per cent alcohol at from 83 to 84° C. for three hours is recommended for the complete separation of gliadin. "The separation of gliadin from nongliadin proteins by coagulation in water at the boiling temperature is not quantitative, considerable gliadin not being coagulated under those conditions."

A method for the determination of the strength and baking qualities of wheat flour, C. H. BAILEY (*Jour. Indus. and Engin. Chem., 8 (1916), No. 1, pp. 53–57, figs. 2; Oper. Miller, 21 (1916), No. 2, pp. 104–106, figs. 2*).—The author

has modified the apparatus usually used for this purpose, and outlined a method which eliminates the personal equation, so far as is practicable, in making actual baking and expansion tests. "The use of a machine for mixing, the automatic recording of maximum expansion in the cylinder, and the raising of the dough to a fixed height before baking all tend to render the element of judgment less prominent than has heretofore been the case with most methods. Automatic regulation of the temperature in the fermentation cabinet also contributes to the ease of making the tests."

The determination of moisture in sirups by the calcium carbid method, R. M. West (*Jour. Indus. and Engin. Chem., 8 (1916), No. 1, pp. 31–35, fig. 1*).—As the result of a study of this method the author has devised a new apparatus and has made some changes in the details of the manipulation.

It is concluded that the method is accurate within from 0.3 to 0.4 per cent, and in this respect is equal to the Official Method (E. S. R., 20, p. 512). It is more satisfactory than the Official Method in that the end point is clearly defined and less time is required for the determination. The carbid used should be subjected to a blank test to determine its water equivalent. The method is especially adapted to materials sensitive to higher temperatures and to those which lose volatile substances during the usual process of drying. Concordant results can be obtained with the procedure in the presence of acids if a correction of the acetylene for the total acidity is made.

The determination of reducing sugars.—A volumetric method for determining cuprous oxid without removal from Fehling's solution, F. M. Scales (*Jour. Biol. Chem., 23 (1915), No. 1, pp. 81–87*).—A new volumetric method for the determination of cuprous oxid in Fehling's solution is described. The cuprous oxid is converted directly into cuprous chlorid, an aliquot added to standard iodin solution, and the excess iodin titrated with standard sodium thiosulphate. Dextrose, maltose, lactose, invert sugar, and probably other reducing sugars may be estimated by this procedure. Comparable results with the gravimetric method have been obtained, and only about one-fourth of the time is required.

The procedure may also be used for the quantitative determination of copper.

Analysis of milk and milk products, H. Leffmann (*Philadelphia: P. Blakiston's Son & Co. [1915], 4. ed., rev. and enl., pp. VIII+115, figs. 3*).—This is the fourth edition of the work, revised and enlarged. Analytical processes of practical value are outlined in detail.

The reaction and calcium content of milk as factors in the coagulation process, T. H. Milroy (*Biochem. Jour., 9 (1915), No. 2, pp. 215–228*).—The author reports the results of a number of experiments in vitro to determine the influence of the hydrogen ion concentration and the calcium content of milk on coagulability and digestibility.

It is concluded that "during the course of rennin action there is no change in the [H.] of milk, either in the earlier stage or in the actual separation of the clot. The addition of an alkaline oxalate to milk lowers, while that of $CaCl_2$ raises the [H.]. Fresh milk which has been subjected to a temperature slightly below boiling point for one hour shows a rise in [H.], and a fall in the calcium content. Such milk is only very slowly acted upon by rennin. The coagulability of heated milk may be raised either by the addition of $CaCl_2$ or by raising the [H.]. The former does not act simply by raising the [H.], nor the latter from its effect upon the soluble calcium content. The acid precipitation zone of caseinogen lies on the acid side of the rennin zone of action, but the latter gradually approaches the former as the calcium content of the mixture is lowered, so that in all probability the latter is an extension of the

former toward the neutral point. Calcium chlorid, apart from its effect upon [H.], increases the activity of the rennin ferment from the beginning of the digestion process."

Determination of the degree of homogenization of milk, O. von Sobbe (*Milchw. Zentbl., 43 (1914), No. 20, pp. 503–506; abs. in Jour. Soc. Chem. Indus., 34 (1915), No. 14, p. 813*).—"Two hundred and fifty cc. samples of treated and untreated milk are placed in graduated tubes and allowed to stand for 72 hours at room temperature. Each sample is then divided into three layers of 50, 150, and 50 cc., respectively, and the fat content of each of these is determined by Gerber's method, except in the case of the lowest layer, or untreated milk, when Köhler's method is preferable. Prior to the analysis, each sample is treated with formalin (1 drop to 100 cc. of milk). The fat content of the lowest layer expressed as a percentage of that of the original milk is termed the degree of homogenization."

An easy test for bacteria in milk and cream (Barthel's reductase test improved), H. Jone (*Brooklyn, N. Y.: Author, 1915, pp. 23, fig. 1*).—This publication is designed primarily to meet the needs of milk dealers, creamery employees, condensary employees, etc. Simple and detailed directions for the use of the methylene blue reductase test for the determination of the bacterial activity in milk are given. Directions for the preparation and standardization of an improved methylene blue solution, which must be uniform for accurate results, are also included.

The determination of sucrose in condensed milk, G. W. Knight and G. Formanek (*Jour. Indus. and Engin. Chem., 8 (1916), No. 1, pp. 28–31*).—After discussing the various methods commonly used, the following procedure has been outlined:

The can of milk is heated for a short time in a 100° C. oven, cooled in a desiccator, weighed, and the contents transferred by means of hot water to a 500 cc. volumetric flask. The empty can is then dried and weighed and the weight of the milk (W) determined by difference. The contents of the flask are thoroughly shaken until the solution is homogeneous, filled to the mark with water, cooled to room temperature, and shaken. Aliquot portions of 50 and 100 cc., measured in volumetric flasks, are transferred by rinsing to 200 cc. volumetric flasks and clarified by the addition of 1.7 cc. of 5 per cent phosphotungstic acid and then, after shaking, of 2.1 cc. of a 26 per cent neutral acetate solution.

After being made up to the mark the liquid is filtered and the lead in the filtrate precipitated by the addition of potassium oxalate, a large excess being avoided. The solutions are then filtered, the filtrate being tested for the complete precipitation of the lead and portions polarized at 20°, preferably in a Bates instrument. The direct polarization (P) corrected for the volume of precipitate is obtained by multiplying the reading of the dilute solution by 4 and subtracting the reading of the stronger solution. Other portions of the milk are treated in a similar manner and inverted by means of concentrated hydrochloric acid by standing over night at room temperature. The solutions are then neutralized, again slightly acidified with a few drops of tenth-normal hydrochloric acid, and portions polarized the same as before inversion. The polarization (P^1) is obtained in the same way as the previous polarization. The following formula is used for calculating the sucrose in the condensed milk:

$$\text{Percentage of sucrose} = \frac{26{,}000(P - P^1)}{W(141.7 - T/2)}$$

T=the temperature in degrees at which the invert reading is made.

The determination of ammonia nitrogen in steer's urine, D. C. Cochrane (*Jour. Biol. Chem., 23 (1915), No. 1, pp. 311–316*).—As the result of his studies the author concludes that "figures for nitrogen as free ammonia in the urine of cattle are unreliable because of the decomposition of ammonium carbonate. Figures for total ammonia nitrogen are worthless unless special precautions are taken to overcome the rapid ammoniacal decomposition. Chloroform and toluene fail to prevent the breaking up of the nitrogenous compounds. Sulphuric acid when added to the urine of a steer in sufficient quantity to fix the ammonia present as carbonate and to slight excess retards decomposition to such an extent as to allow time for analysis. All ammonia determinations must be made on daily samples of urine because the sulphuric acid does not completely stop decomposition in a composite sample."

A method for the quantitative determination of lactic acid in urine, J. Schneyer (*Biochem. Ztschr., 70 (1915), No. 3–4, pp. 294–298*).—A method for the quantitative determination of lactic acid, based on the fact that carbon monoxid is liberated when the material is treated with concentrated sulphuric acid, is outlined in detail. Oxalic and aceto-acetic acids interfere with the accuracy of the procedure and must, therefore, be removed, the former by precipitation with calcium chlorid, and the latter by boiling with acid, which converts it to the volatile acetone. One molecule of lactic acid liberates one molecule of carbon monoxid in the reaction, so that the quantity of acid is easily calculated from the volume of gas liberated.

The estimation of lipoid and acid-soluble phosphorus in small amounts of serum, I. Greenwald (*Jour. Biol. Chem., 21 (1915), No. 1, pp. 29–36*).—The author has described a method for the estimation of lipoid and acid-soluble phosphorus in small amounts of serum, in which he has combined the Neumann method of oxidation and the Pouget-Chouchak colorimetric method (E. S. R., 26, p. 406) for the estimation of the phosphorus. The procedure is deemed probably applicable to other tissues.

METEOROLOGY.

Variation in minimum temperatures due to the topography of a mountain valley in its relation to fruit growing, L. D. Batchelor and F. L. West (*Utah Sta. Bul. 141 (1915), pp. 26, figs. 16*).—This bulletin reports the results of a systematic study of temperature variations in a representative area of 15 square miles in Cache Valley where the elevation ranges from 4,428 to 4,901 ft. The observations were confined to the cultivated bench lands on the east side of the valley and valley bottoms, the entire area having a general westerly slope.

It was found that "fruit sections located at the mouth of a canyon experience a higher minimum temperature on the average than localities of similar elevations which are out beyond the influence of the canyon breezes. This difference is increased with velocity of the canyon breeze.

"The low bottom lands of nearly the same elevation in a mountain valley vary somewhat in the minimum temperatures experienced due to topography of the locality; as a whole, however, these districts are subject to a minimum temperature of only small variance if the opportunity for air drainage is similar. Localities of similar slope and elevation along the bench lands, and with equal chance for air drainage, experience nearly identical average minimum temperatures. A small difference in elevation may be somewhat equalized by a difference in the opportunity for air drainage. The minimum temperatures experienced by the bench lands, and upper slopes of the tillable area in a mountain valley average from 6° to 10° F. warmer than the valley bottoms,

due to the drainage of cold air to the low areas during the typical clear, calm, frosty nights. . . .

"The variation in the minimum temperatures of the high and the low portion of a valley are reduced about 60 per cent during cloudy weather. The clouds interfere with free movement of the cold air flowing to low areas. During windy weather the low areas may experience a slightly higher minimum temperature than the bench land due to their protected positions. The wind has a tendency, however, to equalize the temperature of the various areas in a valley.

"The variations in minimum temperatures experienced by the highlands and lowlands of a mountain valley due to the drainage of cold air to the bottoms is much the same throughout the year regardless of season. The variations in maximum temperatures experienced by different sections of a mountain valley were only slight during the period under observation compared with the variations in minimum temperatures, and bore little or no relation to the latter."

The general conclusion is that "the success or failure of a fruit orchard in the intermountain States might depend entirely upon its location within a given area of tillable land."

Reforestation and occult condensation, P. DESCOMBES, trans. by H. LYMAN and C. ABBE, JR. (*Assoc. Franc. Avanc. Sci., Compt. Rend., 43 (1914), pp. 337–341; U. S. Mo. Weather Rev., 43 (1915), No. 12, pp. 617, 618*).—Observations by other investigators are cited to show that in certain drainage basins the quantity of water derived from condensation of water vapor ("occult condensation") exceeds that lost by evaporation, and it is maintained that the amount so obtained is greatly decreased by the destruction of forests and other forms of vegetation.

Monthly Weather Review (*U. S. Mo. Weather Rev., 43 (1915), Nos. 11, pp. 543–587, pls. 9, figs. 13; 12, pp. 589–650, pls. 10, figs. 7*).—In addition to weather forecasts, river and flood observations, and seismological reports for November and December, 1915; lists of additions to the Weather Bureau Library and of recent papers on meteorology and seismology; notes on the weather of the months; solar and sky radiation measurements at Washington, D. C., during November and December, 1915; condensed climatological summaries; and the usual climatological tables and charts, these numbers contain the following articles:

No. 11.—Increased Solar Activity and Atmospheric Optical Phenomena, by J. Maurer; Aurora of June 16–17, 1915, by D. F. Manning; Aurora of June 16–17, 1915, at Ashland, Ohio, by S. W. Brandt; Study of the Upper Air by Means of Telescopes; Working Up of Wind Observations (illus.), by J. W. Sandström; Waterspouts Observed off Cape San Lucas (illus.), by W. J. Fisher; Circulation and Temperature of the Atmosphere, by W. H. Dines; Forecasting Thunderstorms, by G. Guilbert, with Comments by Durant-Gréville (illus.); A Breathing Well, by J. Free; A Temperature Inversion in the Grand River Valley, Colo. (illus.), by E. S. Nichols; Relation between Meteorological Conditions in the Netherlands and Some Circumjacent Places, by J. P. van der Stok; Internal Structure of the Earth and the Moon, by H. Jeffreys; Snow Survey on Cottonwood Creek, Idaho, by A. J. Henry; and Tornado at Pace, Fla., November 26, 1915.

No. 12.—Solar Radiation Intensities at Santa Fe, N. Mex., during September, November, and December, 1915, by H. H. Kimball; A Halo in the Making, by J. R. Weeks; Lunar Halo of June 24–25, 1915, at Richmond, Va., by T. R. Brooks et al.; The Penetrating Radiation Present in the Atmosphere, by A. Gockel; Concomitant Changes in Terrestrial Magnetism and Solar Radiation,

by L. A. Bauer; The Radio-active Deposit from the Atmosphere on an Uncharged Wire, by S. J. M. Allen; Penetrating Radiation at High Altitudes, by W. Kolhörster; (Auroræ, Earth Currents, and Magnetic Disturbances, by O. Klotz; The Melting of Snow (illus.), by R. E. Horton; Meteorology and Seismology at the Pan American Scientific Congress, by C. F. Talman; Abstracts of Papers at the Pan American Congress; The Meaning of the Word "Fair" in Meteorology, by Eleanor Buynitzky; The Aurelia Alto-cumulus Cloud (illus.), by G. Reader; Tornadoes in Kansas, by S. D. Flora; Reforestation and Occult Condensation, by P. Descombes (see p. 614); Percentage Frequency of Thunderstorms in the United States, 1904–1913; Storms and Hurricanes in Jamaica, 1655–1915, by M. Hall; The Application of Physical Principles to Problems Suggested by Oceanic Circulation and Temperatures, by G. F. McEwen; Albert Adams Young, 1836–1916, by J. H. Armington; Earthquakes Felt in the United States During 1915, by W. J. Humphreys; and The Tornado of December 17, 1915, in Eastern Mississippi, by D. McNeal.

Climatological data for the United States by sections (*U. S. Dept. Agr., Weather Bur. Climat. Data, 2 (1915), Nos. 11, pp. 224, pls. 2, figs. 8; 12, pp. 226, pls. 2, figs. 9*).—These numbers contain, respectively, brief summaries and detailed tabular statements of climatological data for each State for November and December, 1915.

Meteorological summaries for the years 1912, 1913, and 1914 (*Kentucky Sta. Rpts. 1912, pp. 551, 552; 1913, pp. 619, 620; 1914, pt. 1, pp. 119, 120*).—Summaries are given of monthly and annual precipitation, 1872 to 1912, 1913, and 1914, and of temperature, precipitation, wind movement, and cloudiness during 1912, 1913, and 1914.

Meteorological summary for the year 1914, H. G. Knight and F. Brown (*Wyoming Sta. Rpt. 1915, pp. 108–113*).—Monthly summaries are given of observations at Laramie, Wyo., during 1914 on temperature, pressure, precipitation, humidity, sunshine, and wind movement. The highest temperature was 86° F., August 16; the lowest, —29°, February 6. The total precipitation was 9.28 in. The highest relative humidity was 100 per cent, January 19; the lowest, 9 per cent, December 9. The greatest velocity of wind was 60 miles per hour, June 26. The first killing frost was September 13.

Nitrogen, chlorin, and sulphates in rain and snow, B. Artis (*Chem. News, 113 (1916), No. 2928, pp. 3–5*).—This is a report of a continuation, during the period from October 12, 1914, to June 19, 1915, of observations previously reported (E. S. R., 32, p. 616). The results are given of determinations of sulphates, nitrates, nitrites, nitrogen as free ammonia, nitrogen as albuminoid ammonia, and chlorin, in 35 samples of rain and 16 of snow collected at Mt. Vernon, Iowa.

The rainfall amounted to 15.35 in. and the snowfall to 37.75 in., equivalent to 18.49 in. of rain. The amounts of different substances brought down per acre in the precipitation were as follows: Sulphates 4.913 lbs., nitrates 0.793, nitrites 0.051, nitrogen as free ammonia 1.544, nitrogen as albuminoid ammonia 6.654, and chlorin 34.037.

SOILS—FERTILIZERS.

Soil survey of Lawrence County, Alabama, H. G. Lewis and J. F. Stroud (*U. S. Dept. Agr., Advance Sheets Field Operations Bur. Soils, 1914, pp. 50, figs. 2, map 1*).—This survey, made in cooperation with the State of Alabama and issued January 20, 1916, deals with the soils of an area of 448,000 acres in northwestern Alabama.

"The topographic features of the county are quite varied and fall into four main divisions, the Tennessee River and creek flood plains, the mountain areas, the valley section, and the Coastal Plain. . . . Drainage is well established throughout the county." The soils are of residual and alluvial origin. Thirty soil types of 11 series are mapped, of which the Decatur clay loam is the most extensive type, with the Dekalb silt loam and stony loam second and third in extent.

Soil survey of Pottawattamie County, Iowa, A. L. GOODMAN, P. HANSON, and H. W. REID (*U. S. Dept. Agr., Advance Sheets Field Operations Bur. Soils, 1914, pp. 30, fig. 1, map 1*).—This survey, made in cooperation with the Iowa Experiment Station and issued February 10, 1916, deals with the soils of an area of 612,480 acres in southwestern Iowa. "About three-fourths of the county consists of smoothly rolling to hilly loessial uplands, and the remaining 27 per cent of the area consists of flat to very gently undulating alluvial plains, mostly first bottoms. . . . The county as a whole is drained toward the southwest through the main tributaries of the Missouri River, including Boyer and East and West Nishnabotna rivers, and Mosquito and Pigeon creeks. The overflowed bottom lands along these drainage ways are comparatively wide and comprise some of the most fertile lands in the county."

The soils of the county range from very fine sand to clay in texture and are of sedimentary, eolian, colluvial, and alluvial origin. Nine soil types of six series are mapped, of which the Marshall silt loam covers 68 per cent of the area and the Wabash silt loam 13.4 per cent.

Soil survey of Harrison County, Missouri, E. S. VANATTA and E. W. KNOBEL (*U. S. Dept. Agr., Advance Sheets Field Operations Bur. Soils, 1914, pp. 36, fig. 1, map 1*).—This survey, made in cooperation with the Missouri Experiment Station and issued January 15, 1916, deals with the soils of an area of 461,440 acres in northwestern Missouri.

"There are three main topographic divisions in the county, the uplands, terraces, and bottom lands. The surface configuration of the first is gently undulating to broken, of the second gently undulating, and of the third flat to gently undulating. The bottom lands are subject to overflow. The eastern third of the county is drained by Thompson Fork of Grand River and its tributaries, the central half by Big Creek and its tributaries, and the western sixth by several minor creeks."

The upland soils are of glacial origin and are loams and silts in texture. The terrace soils are silts and the first bottom soils very fine sand to clay. Ten soil types of eight series are mapped, of which the Shelby loam is much the most extensive, with the Grundy silt loam second, and the Wabash silt loam with a colluvial phase third in extent.

Soil survey of the Freehold area, New Jersey, H. JENNINGS, J. B. R. DICKEY, and L. L. LEE (*U. S. Dept. Agr., Advance Sheets Field Operations Bur. Soils, 1913, pp. 51, pl. 1, fig. 1, map 1*).—This survey, made in cooperation with the New Jersey Geological Survey and the New Jersey Experiment Station and issued February 4, 1916, deals with the soils of an area of 195,520 acres in eastern New Jersey, which lies in the Coastal Plain and includes northern Monmouth County and part of eastern Middlesex County. The topography of the area varies in general from level to undulating, with some comparatively hilly sections. The area is drained by small streams.

The soils vary greatly in texture and in the materials from which they are derived. Including several miscellaneous types, 38 soil types of eight series are mapped, of which the Sassafras series, including loam, loamy sand, fine sandy loam, sand, sandy loam, fine sand, and coarse sand, is the most extensive.

Soil survey of Bryan County, Oklahoma, W. T. CARTER, JR. and A. L. PATRICK (*U. S. Dept. Agr., Advance Sheets Field Operations Bur. Soils, 1914, pp. 52, fig. 1, map 1*).—This survey, issued November 22, 1915, deals with the soils of an area of 593,920 acres in southeastern Oklahoma, the topography of which is mainly undulating to rolling, with some small rough and hilly areas.

The county is divided into prairies and forested uplands, overflowed first-bottom lands, and second-bottom lands. The soils range in texture from light, fine sands to heavy clays and are of sedimentary and alluvial origin. Thirty-one soil types of 12 series are mapped, of which the Durant loam and fine sandy loam are the most extensive, covering 24 and 25.1 per cent of the area, respectively.

Reconnoissance soil survey of northeastern Wisconsin, W. J. GEIB, L. R. SCHOENMANN, A. E. TAYLOR, A. L. BUSER, C. C. THOMPSON, and C. B. POST (*U. S. Dept. Agr., Advance Sheets Field Operations Bur. Soils, 1913, pp. 101, pls. 8, figs. 2, map 1*).—This survey, made in cooperation with the Wisconsin Geological and Natural History Survey and the College of Agriculture of the University of Wisconsin, and issued December 17, 1915, deals with the soils of an area of 3,902,720 acres, including 6 counties, in northeastern Wisconsin. The surface features are characteristic of a glaciated region and the topography varies from level to rough and broken. The drainage is into Lake Michigan and the Mississippi River basin.

The soils are mainly of glacial origin. Including peat, muck, and rock outcrop, 29 soil types of 11 series are mapped, of which the Gloucester silt loam, fine sandy loam, sandy loam, and fine sand, and the Miami fine sandy loam are the predominating types.

Soil survey of the Bayfield area, Wisconsin, A. R. WHITSON, W. J. GEIB, L. R. SCHOENMANN, F. L. MUSBACK, and G. B. MAYNADIER (*Wis. Geol. and Nat. Hist. Survey Bul. 31 (1914), Soil Ser. 5, pp. 51, pls. 5, figs. 2*).—This survey has been previously noted (E. S. R., 29, p. 17).

Soil survey of Iowa County, Wisconsin, A. R. WHITSON, W. J. GEIB, T. J. DUNNEWALD, E. TRUOG, and C. LOUNSBURY (*Wis. Geol. and Nat. Hist. Survey Bul. 30 (1914), Soil Ser. 4, pp. 61, pls. 3, figs. 2*).—This survey has been previously noted (E. S. R., 29, p. 17).

Soil survey of Waukesha County, Wisconsin, A. R. WHITSON, W. J. GEIB, A. H. MEYER, P. O. WOOD, and G. B. JONES (*Wis. Geol. and Nat. Hist. Survey Bul. 29 (1914), Soil Ser. 3, pp. 82, pls. 4, figs. 2*).—This survey has been previously noted (E. S. R., 29, p. 17).

Soil survey of Waushara County, Wisconsin, A. R. WHITSON, W. J. GEIB, G. CONREY, A. K. KUHLMAN, and J. W. NELSON (*Wis. Geol. and Nat. Hist. Survey Bul. 28 (1913), Soil Ser. 2, pp. 63, pls. 4, figs. 2*).—This survey has been previously noted (E. S. R., 26, p. 718).

Report of soil work (*Ann. Rpt. Sec. Agr. Nova Scotia, 1914, pt. 1, pp. 112–124*).—Analyses of 60 samples of Nova Scotia soils are reported, the results of which are taken to indicate a deficiency in total and available lime and in organic matter and nitrogen. Suggestions for improving the soils are given.

Notes on the soils of the Wairau Plain, Marlborough, L. J. WILD (*Trans. and Proc. New Zeal. Inst., 47 (1914), pp. 413–416, fig. 1*).—The general characteristics of the soils of an area of about 60,000 acres on the east coast of New Zealand, which consists of a flat plain slightly tilted toward the sea, are described.

The soils are of sedimentary origin and range in texture from sandy and gravelly soils in the inner area to fine-grained silts toward the coast. Mechanical and chemical analyses of six soil samples are reported, the results of which are taken to indicate that the soils are relatively well supplied with nutritive constituents.

The nitric nitrogen of the black soils of the arid regions of Russia, N. Tulaĭkov (*Selsk. Khoz. i Lîesov., 247 (1915), Jan., pp. 35–65, fig. 1; abs. in Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases, 6 (1915), No. 6, pp. 797–799*).—Experiments begun in 1910 on manured and unmanured fallow chernozem soil, and the same soil under winter grain, are reported, the object of which was to determine the nitrate content of the chernozem soil and the conditions influencing it. The unmanured fallow comprised four different kinds, viz, so-called "black fallow" land (not plowed until autumn), and April, May, and June fallows (the land being plowed about the twentieth of the respective months). The land was plowed to a depth of 7 in. and soil samples taken at depths of 10 and 20 in.

Under farming conditions, the accumulation of nitrates in fallow land began from the moment of plowing and, in general, as soon as the soil was well broken up. Aeration was evidently more important than the temperature of the soil, at least at the beginning of the accumulation of nitrates. The following conclusions are drawn from the results obtained:

"The black soils of the arid zone of the Province of Samara (and of other Provinces under similar conditions) possess a very strong capacity for nitrification. Under favorable conditions of tilth and when there is sufficient moisture and a high enough temperature the action of the nitrifying bacteria may become very pronounced and large quantities of nitric nitrogen may accumulate. The largest amount of nitric nitrogen is accumulated in fallow land toward the commencement of August in the case of autumn-plowed fallow. Further, the sooner the fallow is plowed in spring the more nitric nitrogen accumulates in the ground.

"The depth to which regularly cultivated fallow land is plowed has not much importance as regards the accumulation of nitrates. Manuring the soil with dung only increases to a very small extent the amount of nitrates as compared with unmanured fallow.

"In plats occupied by winter cereals the quantity of nitric nitrogen decreases very rapidly. The greater part is used by the growing winter rye or wheat; most of the rest is evidently transformed into compounds insoluble in water, while finally a very small part may be transported to the deeper layers of the soil (below 20 in.).

"The breaking up of the soil after the harvest of winter cereals gives an opportunity, under favorable meteorological conditions, for the accumulation of a large quantity of nitrates toward the end of September even if at harvest time there was a very small amount of these compounds in the soil. The accumulation of nitrates in the soil, under the conditions obtaining in the black soil regions of Russia, is much facilitated by the fact that all the measures taken by the agriculturist to accumulate water in the soil . . . conduce at the same time to the accumulation of nitrates."

Peat lands in Minnesota and Wisconsin, J. T. Stewart (*Jour. Amer. Peat Soc., 8 (1915), No. 1–2, pp. 16–22*).—The author deals with the general characteristics of the peat soils of Minnesota and Wisconsin from the viewpoint of the agricultural engineer.

The economic utilization of peat and moors, P. Hoering (*Moornutzung und Torfverwertung. Berlin: Julius Springer, 1915, pp. XVIII+638*).—This book deals with the economic utilization of peat and peat moors, with special reference to dry distillation.

The first part is a general discussion of the origin and formation of peat and peat moors, the methods and requirements of moor development, and moor cultivation in European countries and its economic importance. The second part deals with the chemical and physical properties of peat with reference to

the agricultural development of peat lands, but more especially with reference to the distillation products of peat. The third, or technical part, deals with the methods of securing peat and with its utilization for fuel and for gas manufacture.

The average thorium content of the earth's crust, J. H. J. Poole (*Phil. Mag. and Jour. Sci., 6. ser., 29 (1915), No. 172, pp. 483–489; abs. in Beibl. Ann. Phys., 39 (1915), No. 11, p. 400*).—Tests of the thorium content of 86 samples of acid rocks, 48 samples of neutral rocks, and 56 samples of basic rocks showed respective averages of 2.05×10^{-5}, 1.64×10^{-5}, and 0.56×10^{-5}, and a general mean of 1.05×10^{-5}. The thorium content resembled the radium content in that it decreased in passing from acid to basic rocks, but no exact numerical relation existed between the two.

Soil formation and composition, J. W. Ames (*Mo. Bul. Ohio Sta., 1 (1916), No. 2, pp. 46–49*).—This is a brief discussion of the subject.

The formation of humus by means of vegetable compounds, A. Trusov (*Selsk. Khoz. i Lîesov., 246 (1914), Oct., pp. 233–245; abs. in Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases, 6 (1915), No. 4, pp. 540, 541*).—Laboratory experiments on different organic substances forming humus and the influence of chemical substances and temperature thereon are reported.

"The substances giving rise to the formation of humus are the nonoxiding bases and acids. . . . The monosaccharids and disaccharids are transformed into polysaccharids, which in their turn undergo subsequent dehydration, resulting in the decomposition of the molecule and oxidation with formation of humus. In cases where oxidation does not take place, i. e., during the formation of ulmin and ulmic acid, the action is simply dehydration."

With reference to the influence of temperature it is thought that the formation of humus is an intermediate stage in the carbonization of the material, Experiments with aldehydes, ketones, and the series of polyatomic alcohols showed that "aldehydes can only promote the formation of humus when associated with other compounds such as the polyatomic alcohols. Similarly ketones alone do not lead to the production of humus unless associated with compounds of other series."

The author concludes "that the formation of humus should not be considered as due to the disordered decomposition of molecules, but, on the contrary, to a series of definite reactions, especially with associated compounds, such as the aldehyde-alcohols, ketone-alcohols, etc." It is suggested "that the formation of humus in nature takes place by an identical process, with the difference that the micro-organisms of the soil play the rôle of the acids and bases."

Relation between certain bacterial activities in soils and their crop-producing power, P. E. Brown (*U. S. Dept. Agr., Jour. Agr. Research, 5 (1916), No. 18, pp. 855–869*).—Ammonification, nitrification, and nitrogen fixation tests made at the Iowa Experiment Station, using the soil-culture method, are reported of a uniform loam soil of the Wisconsin drift area. Three series of field plats, receiving rotation, liming, and manurial treatments, respectively, were used in the work (E. S. R., 31, p. 121).

The results obtained as a whole "show that . . . the ability of soils to bring about the simplification of nitrogenous materials or the addition of nitrogen may be considerably modified by various methods of soil treatment. Furthermore, they . . . [show] that certain bacterial activities in the soil may be very closely related to the actual crop-producing power of the soil. The ammonifying power of soils, their nitrifying power, or even, in certain cases, their azofying power may, therefore, indicate the crop-producing power of soils or, at least, their relative crop-producing power."

Soil fertility experiments, G. Roberts (*Kentucky Sta. Rpt. 1914, pt. 1, pp. 36, 37*).—Six years' experiments at the Burnside experimental field, Pulaski County, with different crops on an unproductive soil indicated "that potash is not necessary on these soils, but that without phosphates no headway can be made in restoring such soils to a productive state. The chief requirements of these soils are phosphorus, organic matter, and nitrogen."

At London, Laurel County, experiments on a very thin soil typical of the base of the coal measures indicated that "the requirements for restoring this land are the use of phosphate, limestone, and organic matter, although much can be accomplished without the use of limestone."

At the Greenville field, Muhlenberg County, phosphorus and nitrogen markedly increased the yield on unproductive soil, while at the Lexington field, Fayette County, neither phosphorus, potassium or lime, nor their combinations gave any appreciable increase in the crops used in the rotation extending through four years and including four corn crops, three wheat crops, three soy bean crops, and one clover crop. However, lime was found to give very large increases on alfalfa and sweet clover on the same farm.

[Soil fertility experiments], J. H. Kastle (*Kentucky Sta. Bien. Rpt. 1914–1915, pp. 7–12*).—A review of results of field fertilizer experiments conducted at different experimental fields in Kentucky "confirms the results of chemical analysis as to the requirements of the soils represented in these particular areas. The need for maintaining the supply of humus and available nitrogen through the cultivation of leguminous crops and by the return to the land of the manurial equivalent of the crops removed is emphasized, as is also the need of all soils outside of the blue grass region for phosphorus and the need of many of the soils for lime."

The influence on crop and soil of manures applied to permanent meadow, C. Crowther and A. G. Ruston (*Jour. Agr. Sci. [England], 7 (1915), No. 2, pp. 197–218, figs. 3*).—Experiments conducted since 1899 on one-twentieth acre plats of a dry light loam meadow soil poor in lime are reported. The purpose was to determine the effect of annual and biennial dressings of manure, of alternate annual dressings of manure and various artificial fertilizers, and of complete and incomplete mixtures of artificial fertilizers, and the comparative effects of sodium nitrate and ammonium sulphate on the soil and the hay crop. Manure was added at the rate of 10 tons per acre, sodium nitrate at the rate of 50 lbs., superphosphate at the rate of 200 lbs., kainit at the rate of 300 lbs., and ammonium sulphate at the rate of 130 lbs.

It was found that the crops obtained from annual applications of manure were only slightly larger and more costly to obtain than those from the biennial treatment, especially if in the latter treatment a light dressing of artificial fertilizers, including sodium nitrate, was given in the alternate year. Good average crops were obtained with a complete artificial fertilizer including sodium nitrate, but not equal to those obtained with biennial applications of manure. Sodium nitrate was found to be generally better for hay on the soil used than ammonium sulphate, as the continued use of the latter led to a serious deterioration in the botanical composition of the crop. For equal weights the hay grown with dung appeared to have a lower feeding value than that grown with a good mixture of artificial fertilizers. The composition of the ash of the hay did not indicate the character of the manuring, except with regard to potash.

The most marked change in the soil produced by the different treatments was the removal of calcium carbonate by the prolonged use of ammonium salts. Marked changes in the bacterial activity of the soil were also produced. "In some cases the reduction in biological activity is so great that dead grasses

accumulate and form a mat on the soil so thick that the penetration of water to the lower layers is seriously impeded."

Live stock and soil fertility, C. E. Thorne (*Penn. Dept. Agr. Bul. 264 (1915), pp. 285–293*).—Eighteen years' experiments at the Ohio Experiment Station, comparing fresh and barnyard manure and manure reinforced with acid phosphate or rock phosphate at the rate of 40 lbs. per ton of manure, are reviewed.

The results showed that when the manures were added at the rate of 8 tons per acre to corn in a 3-year rotation of corn, wheat, and clover the fresh manure gave better results than the barnyard manure. During the second year both manures had a greater effect than during the first year. Of the phosphorus carriers, the acid phosphate was superior to the rock phosphate, this being more marked in the second than in the first year.

Lime and commercial fertilizers in the maintenance of soil fertility, C. E. Thorne (*Penn. Dept. Agr. Bul. 264 (1915), pp. 173–181*).—A review of field fertilizer experiments at the Ohio Experiment Station on a sandy clay soil using a 5-year rotation of corn, oats, wheat, and clover and timothy mixed, in which lime was added at the rate of 1 ton per acre together with fertilizers and manure, showed that "the lime alone materially increased the yield on the unfertilized land, the gain from lime alone being nearly as great as that from phosphorus alone in the corn crop and considerable greater in the hay crops. When the liming supplemented the use of fertilizers and manure it maintained in the grain crops practically the same additional increase over that produced by the fertilizers that it had given on the unfertilized land, while in the clover and timothy the liming produced nearly twice the increase on the fertilized or manured land that it had on the unfertilized land. . . . These results show the fundamental importance of lime in the maintenance of fertility because of its great effect on the clover crop, but they also show that lime can not take the place of other fertilizing elements, but can only perform its full service when associated with phosphorus, potassium, and nitrogen."

The manurial situation and its difficulties, J. Hendrick (*Jour. Bd. Agr. [London], 22 (1915), No. 7, pp. 609–616*).—In a review of the fertilizer situation in Great Britain it is stated that the most serious scarcity may be expected in potash fertilizers, and that with reference to the other kinds of fertilizers a greater difficulty will arise from want of labor and transportation facilities than from want of raw material.

The nitrogen problem in arid soils, C. B. Lipman (*Proc. Nat. Acad. Sci., 1 (1915), No. 9, pp. 477–480*).—On the basis of investigations conducted at the California Experiment Station it is stated that the most prominent cause of the lack of available nitrogen in the arid soils of California is a feeble nitrifying power of the soil, which is attributed largely to lack of organic matter. Green manuring and the use of barnyard manure and low-grade organic nitrogenous fertilizers, such as steamed bone meal, cotton-seed meal, and sewage sludge, or else ammonium sulphate, are recommended for such soils, together with the use of a straw or manure mulch to prevent overheating of the soil and excessive evaporation.

A report by the author along similar lines has been previously noted (E. S. R., 33, p. 24; 34, p. 219).

Pot experiments on the availability of nitrogen in mineral and organic compounds, J. G. Lipman, H. C. McLean, A. W. Blair, and L. K. Wilkins (*New Jersey Stas. Bul. 280 (1914), pp. 5–23, pl. 1*).—The substance of this bulletin has been noted from the report of the stations for 1914 (E. S. R., 34, p. 129, 132).

Nitrogen utilization in field and cylinder experiments, II, J. G. Lipman, H. C. McLean, A. W. Blair, and L. K. Wilkins (*New Jersey Stas. Bul. 281 (1914), pp. 5–19, pls. 4*).—The substance of this bulletin has been noted from the report of the stations for 1914 (E. S. R., 34, p. 130).

The effect of sulphate of ammonia on soil, R. W. Ruprecht and F. W. Morse (*Massachusetts Sta. Bul. 165 (1915), pp. 73–90*).—Experiments with a soil which received only chemical fertilizers for 33 years are reported, the purpose being to determine the changes produced by the long-continued use of ammonium sulphate.

Treatment of the soil with tenth-normal, normal, 2.5 times normal, and 5 times normal solutions of ammonium sulphate and analyses of the drainage water from the fertilized plats showed that calcium sulphate is readily formed and removed when lime is present in the soil, while after the exhaustion of the lime the salts of iron and aluminum are formed. The absorption of ammonia from ammonium sulphate solutions increased with the increase in concentration of the solution, but not proportionally. Soils previously fertilized with ammonium sulphate without lime absorbed less ammonia than did other soils. The absorption of dyes by these soils was similar to the absorption of ammonia. Ammonium sulphate seemed to have no solvent action on sodium or potassium in the soil in the presence of sufficient quantities of lime, but showed a slight solvent action on potassium in the absence of lime. All the soil extracts were of neutral reaction and it is thought probable that the use of ammonium sulphate does not cause the accumulation of sulphates in soil. The infertility of soils continuously fertilized with ammonium sulphate is attributed to the final formation of the salts of iron and aluminum.

Solution culture studies with rye, barley, and red clover, using extracts from limed and unlimed soils, treated as noted above, showed that the best growths occurred in extracts from limed soils. Culture studies previously noted (E. S. R., 33, p. 328) are briefly reviewed to show the injurious action of iron and aluminum sulphate solutions on the roots of seedling plants.

The action of calcium nitrate and sodium nitrate, O. Reitmair (*Ztschr. Landw. Versuchsw. Österr., 17 (1914), No. 10–11, pp. 729–807, pl. 1*).—The results of 190 field experiments on representative soils in different parts of Austria and Hungary, with oats, rye, potatoes, beets, and corn, to determine the relative fertilizing values of Norwegian calcium nitrate and Chilean sodium nitrate when added to hay crops at the rates of 120 and 100 kg. per hectare (107 and 89 lbs. per acre) and to root crops at the rates of 240 and 200 kg. per hectare, respectively, are reported.

It was found that in the majority of cases sodium nitrate had a greater fertilizing action than calcium nitrate, this being quite marked in some cases especially with root crops. Considering crop yield and cost of fertilizaton and taking the value of sodium nitrate as 100 for all crops, the corresponding values for calcium nitrate were for rye 89.6, oats 90.6, potatoes 83.4, beets 85.7, and corn 75.2.

Lime nitrogen and its value as a top-dressing, M. Hoffmann (*Deut. Landw. Presse, 42 (1915), No. 56, pp. 489, 490*).—This article includes a brief discussion of the manufacture of lime nitrogen and other synthetic nitrogenous fertilizers, and a summary of 114 experiments by others with winter rye, winter wheat, barley, oats, and potatoes, comparing sodium nitrate, ammonium sulphate, and lime nitrogen as top-dressings. In these experiments, taking the value of sodium nitrate at 100, with rye ammonium sulphate averaged in 68 cases 75.7 and lime nitrogen in 33 cases 72.9; with wheat ammonium sulphate averaged in 30 cases 75.7 and lime nitrogen in six cases 79.1; with barley ammonium sulphate averaged in seven cases 77.1 and lime nitrogen in one case

80.1; with oats ammonium sulphate averaged in eight cases 132.5 and lime nitrogen in nine cases 82; and with potatoes ammonium sulphate was 85 in one case and lime nitrogen averaged 62.2 in four cases.

The size of kelps on the Pacific coast of North America, T. C. Frye, G. B. Rigg, and W. C. Crandall (*Bot. Gaz., 60 (1915), No. 6, pp. 473–482, figs. 2*).—The results of observations, conducted as a part of the general investigation of the fertilizer resources of the United States by the Bureau of Soils, are reported which do not tend to confirm the earlier statements of the great length of Nereocystis and Macrocystis, but do confirm those as to the length of *Alaria fistulosa*. The maximum width of *A. fistulosa* was found to be more than twice as great as has been previously reported by others. The longest Macrocystis plant found measured 45.7 meters (about 150 ft.), the longest *Pelagophycus porra* 45 meters, the longest Nereocystis 20.7 meters, and the longest *A. fistulosa* 22 meters. The shortest Alaria, 13 meters long, measured 232 cm. (about 7.6 ft.) in width, the greatest width observed.

A list of references to previous literature bearing on the subject is appended.

The composition of blast furnace gas dust (kali-asch), A. Vürtheim (*Verslag. Landbouwk. Onderzoek. Rijkslandbouwproefstat.* [*Netherlands*], *No. 18, (1915), pp. 86–90*).—Analyses of three samples of the dust of settled blast furnace gas from iron works (kali-asch) showed aqua regia a soluble potash contents of 12, 12.5, and 20.2 per cent, and water soluble potash contents of 7.6 8.7, and 17.1 per cent, respectively. It is stated that the potash content varies so widely with the other constituents that an average percentage can not be determined. In one case the high percentage of chlorids present was thought to have reduced the fertilizing value of the dust for certain crops.

Relation of lime to production of nitrates and mineral nitrogen, F. M. Scales (*Science, n. ser., 42 (1915), No. 1079, p. 317*).—Fractions and multiples of the lime requirement of an acid soil, as determined by the Veitch method and by adding sufficient calcium carbonate to produce a neutral reaction to litmus, were added to 100-gm. portions of the soil, which received in addition ammonium sulphate in one case and alfalfa powder in the other. After moistening with 18 per cent of distilled water and incubating for three weeks at from 28 to 30° C., "determinations of nitrate and mineral nitrogen present in the samples showed that the nitrifying bacteria were most active in the presence of 50 per cent of the calcium carbonate requirement and the ammonifying and nitrifying groups combined in the presence of 75 per cent of the amount required according to the chemical determinations. In this particular soil an excess of calcium carbonate was markedly toxic for the nitrifying organisms and not stimulating for the ammonifiers."

Catalytes and their relation to crops, L. A. Musso (*Rpt. Austral. Assoc. Adv. Sci., 14 (1913), pp. 667–671*).—The author reviews and discusses briefly the results of experimental work by others on the use of catalytic fertilizers.

Influence of some manganese compounds containing oxygen on nitrification, G. Leoncini (*Staz. Sper. Agr. Ital., 47 (1914), No. 11–12, pp. 777–801*).—Experiments with lime, clay, and humus soils in compact and loose condition to determine the influence of manganese dioxid and natural manganese hydrate on nitrification when added in amounts as large as 6 per cent and as small as from 0.035 to 2.2 per cent showed that both manganese compounds, and the dioxid in particular, as a rule, retarded the nitrification of ammonium sulphate in these soils and favored denitrification. In small percentages up to 0.184, both compounds, the dioxid especially, aided nitrification, but beyond this concentration nitrification was retarded. It is concluded that these compounds may be used on such soils in concentrations not exceeding 0.184 per cent.

Influence of fluorin on vegetation, A. GAUTIER (*Compt. Rend. Acad. Sci. [Paris], 160 (1915), No. 6, pp. 194, 195; abs. in Jour. Chem. Soc. [London], 108 (1915), No. 629, I, p. 110; Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases, 6 (1915), No. 4, pp. 564, 565; Chem. Abs., 9 (1915), No. 10, pp. 1361, 1362*).—A comparison of the behavior of various species of plants when grown in an artificial soil almost completely deprived of fluorin, in the same soil supplied with fluorin, and in an ordinary arable soil showed that in a few cases the fluorin appeared to have an inhibitory effect but in most cases it increased growth, flowering, and the production of seed.

The manurial value of locusts, A. E. COLLENS (*Bul. Dept. Agr. Trinidad and Tobago, 14 (1915), No. 6, p. 199*).—Analyses of Cedros and Venezuelan locusts when fresh, air-dried, and dry show respective nitrogen contents of 3.34, 9.98, and 11.3 per cent for the former, and 5.31, 10.99, and 12.18 per cent for the latter.

Meadow fertilization with sewage sludge, EBERHART (*Deut. Landw. Presse, 42 (1915), No. 72, p. 623*).—Field experiments on meadow land, varying from light sandy loam to clay loam, to determine the fertilizing value of Emscher tank sludge, a sludge resulting from a mechanical-chemical sewage purification process (Eisenklärschlamm), and so-called "Baggergut sludge," are reported. The sludges were added at rates of 100 kg. per 100 square meters (about 8,900 lbs. per acre) and 300 kg. per 100 square meters.

Analyses of the sludges showed that, in the order named, they contained total nitrogen 1.86, 2.06, and 1.21 per cent; total phosphorus 1.25, 2.45, and 1.21 per cent; lime 6.25, 6.52, and 5.17 per cent; and total potash 0.25, 0.23, and 0.14 per cent. An increase in the hay crop due to the sludge was observed in all cases, the "Baggergut sludge" giving the poorest results. The addition of Thomas meal and kainit with the sludges had no marked effect. The highest yield was obtained with the addition of 300 kg. of Emscher sludge per 100 square meters.

Peat litter and peat litter works, V. ZAILER (*Torfstreu und Torfstreuwerke. Hannover: M. and H. Schaper, 1915, pp. VIII+320, figs. 160*).—This book presents the results of the author's experience and studies in numerous peat litter works of those European countries having extensive areas of peat moors. An introductory section gives a brief statement of the development of the peat litter industry. The first main section describes the different kinds of peat, and discusses the physical and chemical properties and uses of peat dust and litter and the properties and uses of peat fertilizers. The second section deals with the organization, management, and financing of peat litter industries and the profits realized therefrom.

A list of European firms interested in the peat industry is appended.

Analyses of inspection samples of fertilizers, J. T. WILLARD and R. C. WILEY (*Kansas Sta. Insp. Circ. 1 (1915), pp. 7*).—This circular contains the results of actual and guarantied analyses of 88 samples of fertilizers and fertilizing materials offered for sale in Kansas during the spring months of 1915. In general the results indicate conformity to the law.

Inspection of commercial fertilizers, H. D. HASKINS, L. S. WALKER, C. P. JONES, and W. S. FROST (*Massachusetts Sta. Control Ser. Bul. 4 (1915), pp. 100*).—This bulletin contains a list of dealers who registered fertilizers and lime compounds for sale in Massachusetts during 1915, and reports and discusses the results of actual and guarantied analyses and valuations of 721 samples of fertilizers and fertilizing materials and lime compounds collected in the State during 1915.

Special attention is called to commercial shortages existing in both unmixed fertilizing materials and mixed goods. Particular emphasis is laid upon the

economy of purchasing only high-grade fertilizers. A brief account is given of a vegetation experiment made to show the efficiency of the alkaline permanganate method as an indication of the activity of water-insoluble organic nitrogen.

Analyses and valuations of commercial fertilizers, fertilizer supplies, and home mixtures, C. S. CATHCART ET AL. (*New Jersey Stas. Bul. 285 (1915), pp. 3–45*).—This bulletin contains actual and guarantied analyses and valuations of 570 samples of fertilizers offered for sale in New Jersey during the year 1915. These included 395 brands of mixed fertilizers, 21 home mixtures, and 154 samples of fertilizer materials.

Commercial fertilizers (*Penn. Dept. Agr. Bul. 269 (1915), pp. 85*).—This bulletin reports and interprets the results of actual analyses made at the Pennsylvania Experiment Station of 610 samples of fertilizers and fertilizing materials offered for sale in Pennsylvania from January 1 to August 1, 1915, together with the guaranties therefor. The text of the fertilizer law is also included.

Fertilizers, 1915 (*Lab. Inland Rev. Dept. Canada Bul. 317 (1915), pp. 45*).—This bulletin contains the results of actual and guarantied analyses of 420 samples of fertilizers and fertilizing materials offered for sale in Canada during 1915. Of this number, 11 samples failed to meet the guaranty, the deficiency being in potash in three cases.

AGRICULTURAL BOTANY.

Effect of elemental sulphur and of calcium sulphate on certain of the higher and lower forms of plant life, W. PITZ (*U. S. Dept. Agr., Jour. Agr. Research, 5 (1916), No. 16, pp. 771–780, pl. 1*).—Other investigators having shown the beneficial effects of elemental sulphur or sulphates added to the soil, the author conducted, at the Wisconsin Experiment Station, a series of experiments to note the effect of sulphur and sulphates upon the soil micro-organisms and on pure cultures of legume bacteria, and to note the effect of sulphur and sulphates on the growth of red clover.

The addition of calcium sulphate to the soil was found to have no marked effect on the total number of bacteria grown on agar plates, nor did it produce any marked increase in ammonification or nitrification, these results agreeing with those previously reported by Fred and Hart (E. S. R., 33, p. 515). The addition of large amounts of elemental sulphur caused a decrease in the total number of bacteria but an increase in the ammonification at concentrations of 0.05 per cent. This increase was accompanied by a parallel decrease in nitrate formation. Calcium sulphate was found to stimulate growth of pure cultures of red clover bacteria and the root development of red clover in nutritive solutions and soil extract, the increase being as great with 0.01 per cent as with 0.1 per cent. In small amounts, calcium sulphate was also found to increase the yield of red clover and the number of nodules. Sulphur increased the yield of red clover but slightly, and did not affect the root development and the number of nodules.

Boron: Its absorption and distribution in plants and its effect on growth, F. C. COOK (*U. S. Dept. Agr., Jour. Agr. Research, 5 (1916), No. 19, pp. 877–890*).—This is a detailed account of investigations previously partially reported (E. S. R., 34, p. 428). Both borax and calcined colemanite were employed.

There was found to be little difference in the quantity of boron absorbed by plants whether it was added to the soil in the form of borax or as colemanite. Numerous factors were found to influence the absorption, distribution, and action of boron in plants.

As a result of the investigations, the author claims that no more than 0.62 lb. borax or 0.75 lb. calcined colemanite should be added as a larvicide to each 10 cu. ft. of manure, and that when using the boron-treated manure in growing leguminous plants it should be thoroughly mixed with untreated manure before being added to the soil. With other plants, boron-treated manure should not be used at a higher rate than 15 tons per acre.

The influence of the radiations of radium upon the germination of seeds (oats), H. LAWRENCE (*Rpt. Austral. Assoc. Adv. Sci., 14 (1913), pp. 325, 326*).—The author's experiments are said to have shown the total destruction of oat seeds exposed to radium emanations at distances not greater than 0.75 in. Beyond that limit there was a decrease with the increasing distance of the retarding effect of radium upon the growth of the seeds, and the development of a stimulating effect at greater distances up to 5 in.

Some effects of ethylene on the metabolism of plants, E. M. HARVEY (*Bot. Gaz., 60 (1915), No. 3, pp. 193–214, figs. 2*).—The author, reporting a study of pea seedlings in this connection, states that ethylene was found to be very effective, even in attenuated solutions, in producing changes in the general processes of plant metabolism. The simple soluble substances were increased at the expense of the higher soluble and insoluble forms. The acidity of the tissue treated with ethylene remained unchanged. Ethylene caused an increase of osmotic pressure, but did not greatly increase permeability. It retarded both carbon dioxid production and oxygen absorption. The respiratory ratio remained practically the same, except in the shortest exposure period (three hours) in which, apparently, an excessive production of carbon dioxid occurred.

A bibliography is given.

The rate of absorption of various phenolic solutions by seeds of Hordeum vulgare, and the factors governing the rate of diffusion of aqueous solutions across semipermeable membranes, A. J. BROWN and F. TINKER (*Proc. Roy. Soc. [London], Ser. B, 89 (1915), No. B 611, pp. 119–135, figs. 4*).—A further study (E. S. R., 28, p. 226) of the phenomena of diffusion through seed coats of *H. vulgare*, employing phenolic solutions, has led to the conclusion that when the osmotic pressures, vapor pressures, and viscosities of a series of solutions of permeable solutes are equal, their rates of diffusion through the barley membrane are inversely proportional to their surface tensions.

Chemistry and structure of plant cell membranes, J. KÖNIG and E. RUMP (*Chemie und Struktur der Pflanzen-Zellmembran. Berlin: Julius Springer, 1914, pp. 88, pls. 9, figs. 8*).—Besides an extended historical introduction, an account is given of studies by the authors on the chemical composition, microscopic structure, etc., of cell membranes from a number of plants.

It is stated that the chemical substances left in the cell membranes after the removal of the protein, fat, wax, chlorophyll, sugar, starch, acids soluble in water, and cutin, fall particularly into the pentosan, hexosan, and lignin groups. Microscopic studies are said to show the incorrectness of the view that a chemical union exists between cellulose and the substances associated therewith.

Studies in experimental morphology, H. LUNDEGÅRDH (*Flora, n. ser., 7 (1915), No. 4, pp. 433–449, figs. 14*).—The author describes the results of a study on the polarity of *Coleus hybridus*, and on leaf heteromorphy in *Ipomœa leari* with corresponding alterations in the anatomy of the stem.

Autoparasitism of Cassytha melantha, A. D. HARDY (*Rpt. Austral. Assoc. Adv. Sci., 14 (1913), pp. 321–324, pl. 1*).—Noting observations made upon *C. melantha*, the author states that frequently when a branch of the plant has outgrown the twig on which it is parasitic and failed to find another or a new

host plant by circumnutation, it turns back upon itself. Although not affected by contact with itself while the host was available, the shoot now readily responds to the stimulus of this contact, twines around its own lower portion, and produces haustoria which absorb nutriment therefrom. Field and laboratory studies show that a physiological connection is established in such cases.

It appears to the author that in this way the spreading or nutating shoot escapes death from starvation, and by retracing its course is enabled to reach a fresh portion of the host or to find a new one.

This is considered as a notable addition to the facts existing in favor of the theory that the haustoria are new formations produced for a special purpose.

Oxidation of ammonia or nitrification in plants, P. Mazé (*Compt. Rend. Soc. Biol. [Paris], 78 (1915), No. 5, pp. 98–102*).—The author has followed up his previous observations regarding the presence of nitrous acid in water exuded from plants (E. S. R., 28, p. 429) with a study of maize, pea, and vetch in this connection.

It was found that plants kept at a temperature of 30° C. produced no nitrous acid, while a certain amount was formed by those kept at 56 to 57°.

It is thought that the formation of nitrous acid is the resultant of two opposed processes, the temperature of 56 to 57° having a tendency to check reduction more than oxidation, and the conditions produced by the immersion of the plants in water appearing to be unfavorable to the oxidizing action.

A study of nitrogen release by Azotobacter, T. Molér (*Bot. Notiser, No. 4 (1915), pp. 163–178, pl. 1, fig. 1*).—The author has devised and employed a culture filter apparatus which is said to permit of the removal and separate examination of metabolic products from bacterial cultures.

It is stated that *A. chroococcum* during its life separates no soluble nitrogen compounds, but only after death furnishes nitrogen to higher organisms. Starvation brings this organism into a resting condition.

Proteolytic bacterial enzyms are entirely ineffective toward the nitrogenous compounds contained in this organism. The presence of such compounds in cultures is to be explained as due probably to the activities of amœbæ which use it for food.

A. agile and *A. wienlandii* behave in a different way, both separating soluble nitrogen compounds.

Carotinoids in plants, C. van Wisselingh (*Flora, n. ser., 7 (1915), No. 4, pp. 371–432*).—Describing the methods and results of his examination of a large number of plants, the author states that he has been able to demonstrate in a number (which are listed) the presence of two or more carotinoids.

The mode of formation of starch in rootlets of maize and castor oil plant, A. Guilliermond (*Arch. Anat. Micros., 16 (1915), No. 3–5, pp. 549–554, pl. 1*).—The author calls attention to an error (due to wrong labeling of material) which he has discovered in his statement of observations as previously noted (E. S. R., 28, p. 524). This is said, however, not to modify the general results and their interpretations.

The growth of the leaf blade, leaf sheath, and stalk of the sugar cane, J. Kuyper (*Meded. Proefstat. Java-Suikerindus., 5 (1915), No. 8, pp. 211–239, figs. 6*).—The author has devised a method of measuring the growth of the younger portions of the sugar cane plant occurring while these are still invisible from the outside.

Small holes were made with a needle at regular intervals entirely through the bundle of growing parts. On removal of the successive layers some days thereafter, the amount of growth could be determined. The results as regards growth are shown graphically for the several portions. The region of most

rapid growth moves basipetally over leaf and sheath, then down over the internode, the root ring at the base of an internode showing a development of its own which is apparently independent of that of the other parts.

It is thought that these studies may be used to throw light on the origin of the disease called top rot in Java (the cause of which is thought to be unfavorable conditions of growth) by indicating the time at which this trouble begins to affect the growth of the cane.

Stomatal structure in sugar cane, J. KUYPER (*Arch. Suikerindus. Nederland. Indië, 22 (1914), No. 47, pp. 1679–1690, pls. 2, fig. 1*).—Summarizing a study of the structures and relations observed in the stomatal region in sugar cane, the author claims that while any very considerable opening of the central slit is prevented by the thickness of the cell walls, the whole guard cell can move a little on account of its hinge-like attachment to the next cell. The varying relations of the accessory cells are also discussed.

The closure of the stomata was apparently complete after the plant had been kept in darkness for two days.

The author concludes that the guard cells may vary the stomatal opening in a very small degree by changing their position between the neighboring epidermal cells, the position and structure of the accessory cells making it possible to change also the length of the stomatal slit.

The accessory cells are said to originate in epidermal cells on both sides of the mother cells which give rise to the guard cells. Particulars are given regarding the contents of both guard and accessory cells.

The influence of temperature on phototropism, MARIE S. DE VRIES (*Rec. Trav. Bot. Néerland., 11 (1914), No. 3, pp. 195–290, figs. 7*).—Details and results are given of an extended series of experiments testing the relations of prewarming (as regards degree and exposure period), light intensity, and readiness of phototropic response in coleoptiles of *Avena sativa*.

Response proved to be independent of the duration of prewarming between 0 and 25° C. From 27.5 to 30° the amount of light required for a given response was decreased by lengthening the period of prewarming. At and above 32.5°, the longer periods of prewarming exerted an unfavorable influence on perception, as shown by the increased light requirement for a given reaction. The effects of prewarming, favorable or unfavorable, decreased rapidly after the early stages until they became constant. The reaction period also showed considerable dependence upon temperature.

The physiology of pollination, Y. TOKUGAWA (*Jour. Col. Sci., Imp. Univ. Tokyo, 35 (1914), Art. 8, pp. 53, figs. 2*).—The author has made a study of pollen development in connection with ovarial structure and media as related to the possibility of hybridization in nature.

It is stated that the pollen tube requires for its successful development a certain degree of moisture and osmotic pressure, besides, in some cases at least, a special stimulus. Pollen grains are affected unfavorably in different degrees by inorganic salts, those of the heavy metals being in general the most injurious. The life period of the grains is greatly affected by variations in moisture. Sugar and nitrogenous material given together favor pollen development, different species showing high degrees of specificity in this respect. The pollen tubes pass readily into agar or gelatin.

The pollen tube exhibits chemotropism toward the pistillate opening and the micropyle, but its progress within the canal is thought to be mechanical.

Between monocotyledonous and dicotyledonous plants there can be a penetration of the pistillate opening and a certain amount of growth by the pollen tube. The ovary, however, is not reached, probably on account of the lack of

appropriate nourishment, though the pollen apparently utilizes its own reserve material to some extent for its growth.

Cross-fertilization and self-fertilization and the results in heredity, H. Heukels (*Rec. Trav. Bot. Néerland., 12 (1915), No. 3, pp. 278–339*).—The mode of treatment here employed is very largely that of genetics from a mathematical standpoint and method, giving a discussion of results and conclusions reported mainly by other writers.

The question of mitochondria as bearers of heredity, H. Nachtsheim (*Naturw. Wchnschr., 29 (1914), No. 37, pp. 580–583*).—This is a discussion of recent contributions and views regarding the part played by mitochondria in heredity.

The mutation factor in evolution with particular reference to Œnothera, R. R. Gates (*London: Macmillan & Co., Ltd., 1915, pp. XIV+353, pls. 9, figs. 106*).—This is a monographic treatment of the facts which bear upon mutation, attention having been confined chiefly to Œnothera. The author states that the book, in addition to summarizing present knowledge of the subject, contains a large amount of hitherto unpublished material from his own studies and experiments.

Phases of evolution other than mutation are briefly discussed in the first chapter. Subsequent chapters deal with the characters and distribution of the Œnotheras, their cultural history, the mutation phenomena in *Œ. lamarckiana* and in other Œnotheras, the cytological basis of the mutation phenomena, hybridization, and hereditary behavior, the relation between hybridization and mutation, a general view regarding mutation and the lines along which a theory of mutations should probably develop, and, finally, the evolutionary significance of mutations, considering the mutation concept as related to heredity and ontogeny, and mutation in relation to other evolutionary factors.

An extensive bibliography is given.

The genotypic composition of some varieties of the same species and their genetical composition, Tine Tammes (*Rec. Trav. Bot. Néerland., 12 (1915), No. 3, pp. 217–277*).—The author has studied the results of crossing among six varieties of *Linum usitatissimum.*

It is stated that flower color among these varieties was conditioned by two or three factors. In close relation with flower color stand a number of other characters which are named. The nature and results of color factor combinations are detailed.

Species crossing was entirely successful only between *L. usitatissimum* and *L. angustifolium.* Attempts at crossing these species with *L. perenne, L. austriacum, L. narbonense, L. grandiflorum,* and *L. flavum* gave no germinable seed.

Notes on the dissemination of Virginia creeper seeds by English sparrows, B. T. Harvey (*Plant World, 18 (1915), No. 8, pp. 217–219*).—Observations here noted regarding the retention of germinability of seeds of Virginia creeper after distribution by sparrows suggest a degree of importance of this bird in the dissemination of these seeds in central Colorado.

FIELD CROPS.

Report of the agronomist, T. S. Parsons (*Wyoming Sta. Rpt. 1915, pp. 84–93*).—A review of the work for the year 1914 is given and some of the more important results are briefly noted.

As compared with seed from other localities home-grown seed of 8 varieties of oats gave an average increase in yield for two years of 12.98 bu., 9 varieties of wheat 5.4 bu., and 10 varieties of barley 14.82 bu. per acre. In a test of 9

varieties Grimm alfalfa continued to lead in hardiness and yield but alfalfa from native seed and from Montana seed gave nearly as good results. Tests with grain crops seemed to indicate that Oderbrucker barley, Marquis spring wheat, Early Mountain oats, and Buffum No. 17 winter wheat are well adapted to high altitude conditions.

North Dakota wilt-resistant flax also seemed well adapted to high altitudes and yielded at the rate of 20 bu. per acre as compared with 11.5 bu. for local seed. Japanese and Silver Hull buckwheat yielded at the rate of 26 and 24 bu. per acre, respectively, and it is believed that in ordinary seasons buckwheat can be grown at most altitudes of the State where farming is done.

Sweet clover seed when scarified showed a germination of 78 per cent, and when treated with sulphuric acid 89 per cent, while only 48 per cent of untreated seed sprouted. An experiment with barnyard manure in progress for four years showed that the manure produced cumulative rather than immediate results. The applications made the first two years increased the crops to only a small extent but the applications made during the entire period showed a noticeable effect on the physical conditions and the fertility of the soil. The best barley increased from 51 bu. to 96 bu. per acre in 4 years; the best oats from 67 to 92 bu. in 3 years; the best wheat from 29 to 54 bu. in 4 years; and the greatest increase came in the last two years.

Notes are also given on the culture of potatoes, root and other forage crops, and pasture and meadow grasses. Four series of crop rotations entered upon in 1915 are outlined. Feterita, Sudan grass, sorghum, and Kafir did not prove successful at the altitude of the station and it is believed that these crops should not be planted at altitudes over 5,000 ft. A mixture of peas and oats yielded 3 tons of cured hay per acre and proved valuable as a source of silage. A plat of brome grass produced seed at the rate of 312 lbs. per acre, and a meadow mixture of alfalfa and timothy gave a yield of 6,840 lbs. of hay from 3 cuttings, the last 2 being largely alfalfa. Notes are given on the improvements made on the agronomy farm and the seed distribution carried on during the year.

Forage crops for the Colorado Plains, A. Kezer (*Colorado Sta. Bul. 214 (1915), pp. 3–25, figs. 7*).—This bulletin treats in a popular manner of the culture of forage crops without irrigation on the Colorado Plains. The climate, topography, soils, dry-farming methods, and general farm practice and management for the region are discussed and directions for growing alfalfa, corn, sorghum, broom corn, millets, sweet clover, stock melons, peas, peanuts, cowpeas, and soy beans are given. The culture of the small grains and of certain native plants for hay and pasture is also noted.

Chemical analyses of maize and oats cultivated in eastern Uruguay, J. Puig y Nattino (*Min. Indus. [Uruguay], Insp. Nac. Ganadería y Agr. Bol. 14 (1915), pp. 29, figs. 3; abs. in Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases, 6 (1915), No. 10, pp. 1332, 1333*).—This article notes the efforts to improve the native yellow corn by crossing with the North American Gold Dent in order to increase the size of kernel, decrease the size of cob, and in general to increase the yield. Chemical analyses of maize and of oats grown in eastern Uruguay are given, together with the digestible nutrients.

[A study of blue grass] (*Kentucky Sta. Bien. Rpt. 1914–1915, p. 70*).—This gives the results of a study of the conditions affecting the viability and germination of blue grass seed grown in central Kentucky.

Samples taken from fields and barns showed that the lapse of a few months rather improves the germinating power of the seed, but that if it has been subjected to a high temperature during the process of curing in the rick the vitality

of the seed is more or less injured. Data show that seed taken from warehouses that had been subjected to a temperature of 57° C. failed to germinate, those under normal conditions germinated 70 per cent, and those subjected to a temperature of 41° germinated 63 per cent. In a second test the respective values were 0°, 80°, and 81°.

"As a result of our observations it is believed that much of the harm done to blue grass seeds results from the custom of sacking the freshly gathered seeds on the farm and allowing them to lie for too long a time in the sacks before hauling to the warehouses, the result being excessive heating and consequent loss of viability."

Experiments with Sea Island cotton, W. N. Sands (*Imp. Dept. Agr. West Indies, Rpt. Agr. Dept. St. Vincent, 1914–15, pp. 4, 5*).—In experiments with Sea Island cotton the author notes success in increasing the number of 4- and 5-locked bolls by careful selection. The percentage of 4-locked bolls in his selected plants ranged from 16 to 45 and of 5-locked bolls from 0.7 to 2.

The use of white mustard as a green manure plant, P. Wagner (*Illus. Landw. Ztg., 35 (1915), No. 58, p. 381*).—In this experiment four plats were used. One received fallow culture; on another the white mustard was planted after harvest and plowed under in the late fall; on the third the soil received an abundant supply of stable manure before the white mustard was seeded after harvest; and the fourth received barnyard manure and fallow culture.

The effects of these treatments for 17 years on the spring crops of oats, rye, and mangels showed the advantage of using white mustard to some extent without the fertilizer, but in cases where the barnyard manure was used the white mustard produced decidedly satisfactory results. This was due, it is stated, to the large amount of humus added to the soil.

Experiments with oats, F. A. Welton and C. A. Gearhart (*Mo. Bul. Ohio Sta., 1 (1916), No. 2, pp. 35–42, fig. 1*).—This article reports a continuation of work previously noted (E. S. R., 29, p. 36), discusses the culture of the crop, reports tests with thick and thin seeding, the relation of size of kernel to yield, varieties, and northern grown seed, and gives some results obtained by cooperators in growing oats throughout the State.

It is noted that the rates of seeding were varied by 1 pk. from 4 to 12 pk. per acre. The best results were obtained when 11 pk. of seed per acre were used. When large, small, and unscreened seeds were sown side by side the resulting yields did not vary much, although those in favor of the large seed were uniform. Comparisons of North Dakota and Ohio grown seed offered little encouragement of increased yields from imported seed, but indicated that northern grown seed may be used without fear of failure from lack of acclimatization.

Further experience with Phalaris bulbosa, E. Breakwell (*Agr. Gaz. N. S. Wales, 26 (1915), No. 6, pp. 487, 488; abs. in Internat. Inst. Agr.* [*Rome*], *Mo. Bul. Agr. Intel. and Plant Diseases, 6 (1915), No. 10, p. 1340*).—This notes the permanency of this grass under pasturage, its drought resistance, and excellent hay qualities. It is stated that in a region where only 10 in. of rainfall fell in 16 months the majority of the *P. bulbosa* plants were still alive, and quickly showed green shoots after each shower of rain. Various strains of the variety are noted, among which that grown at the Bathurst Experiment Farm is said to be much superior to others tried, often reaching a height of from 4 to 5 ft.

"Dapog" method of rice culture, S. Apostol (*Philippine Agr. Rev.* [*English Ed.*], *8 (1915), No. 2, pp. 98–102*).—This article describes the methods employed in the cultivation of rice where two crops are grown the same season.

The dapog method consists in planting the rice on a bed of finely cut straw, which is placed on a layer of banana leaves spread over the surface of the seed

bed to prevent the roots of the seedlings entering the soil. By keeping the bed of straw at the proper moisture the dapog seedlings are ready to transplant in from 10 to 14 days after the seed has been planted, which is an advantage in hastening the maturity of the crop. The loose conditions afforded by the straw allow of the easy separation of the seedlings for transplanting without injuring their rootlets.

Factors influencing the protein content of soy beans, J. G. LIPMAN, A. W. BLAIR, H. C. McLEAN, and L. K. WILKINS (*New Jersey Stas. Bul. 282 (1914), pp. 5–14*).—The work reported in this bulletin has been noted in part from another source (E. S. R., 34, p. 140).

Brief descriptions regarding growth and ripening are also given of 13 varieties of soy beans tested in 1914, and the yield of dry matter and the nitrogen content of the beans of the different varieties are shown in a table. Ten varieties yielded total dry matter at the rate of 2 tons or more per acre, but only 4 varieties yielded at the rate of 15 bu. or more of shelled beans per acre. In 1914 liming was followed by an average increase of 150 lbs., in the yield of shelled beans for the varieties grown on limed and unlimed land. In 1913 in similar tests the limed plats gave an average increase of total dry matter per acre of 1,105 lbs. and an average increase of shelled beans of 203 lbs. as compared with unlimed plats. The variety Ebony ranked highest in nitrogen content with 7.13 per cent, Medium Yellow stood second with 7.06 per cent, and Manhattan third with 6.97 per cent. Where lime was used all but 3 varieties showed more than 6.5 per cent of nitrogen.

Thickness of planting did not seem to affect the percentage of nitrogen in the dry matter, but for a given area much more nitrogen was recovered in the crop where planting was thick than where it was thin. Certain varieties including Ebony, Medium Yellow, Guelph, and Manhattan, were richer in nitrogen, both the forage and shelled beans, than the other varieties tested. Different fertilizing materials did not greatly influence the percentage of nitrogen in the dry matter but judicious liming increased the nitrogen content of both vines and shelled beans.

The effect of manganese sulphate on the yield of turnips at Wisley, F. J. CHITTENDEN (*Jour. Roy. Hort. Soc., 41 (1915), No. 1, pp. 94–96*).—In this article data show the effect of manganese sulphate and peat, manganese sulphate alone, and manganese sulphate and lime, as compared with a check plat receiving no treatment. The plat receiving nothing gave a lower yield than that which received manganese sulphate and peat. In two out of three cases the manganese sulphate alone increased the yield, while the addition of lime to the manganese sulphate depressed it. The average increase was only 6 per cent in the case of the manganese alone, 21 per cent with manganese and peat, and only 4 per cent with manganese and lime.

The influence of the time and method of preparing the seed bed upon the yield of winter wheat, L. E. CALL (*Kansas Sta. Rpt. 1914, pp. 42–76, figs. 12*).—Studies of this problem made from 1908 to 1913 are described in detail and work along related lines at other stations is briefly reviewed. The results secured from year to year, as the mechanical analysis of the soil, the soil moisture content, the nitrate content and its distribution, the costs of preparing the land, the effect of fertilizers on the crop, and other similar data are given in tables.

In 1908 and 1909 the experiments were conducted on soil lacking in uniformity and the results secured were regarded as reliable only to the extent that they showed a marked increase in yield where the ground was worked early in the season. In 1910 the work was transferred to a field with more satisfactory soil conditions, although it had been plowed shallow in the past

and had been poorly farmed. For the period of the experiment winter wheat was grown on the land continuously. The different methods of soil preparation were as follows: Double disking without plowing, plowing 3 in. deep September 15, double disking July 15 and plowing 3 in. deep September 15, double disking July 15 and plowing 3 in. deep August 15, single listing July 15, listing July 15 and splitting the ridges August 15, plowing 7 in. deep July 15, plowing 7 in. deep August 15, plowing 7 in. deep August 15 and not working the land until September 15, plowing 7 in. deep September 15, and plowing 3 in. deep July 15.

The ground plowed each season on July 15 7 in. deep and thoroughly worked after plowing produced as an average of three years a yield of 28.58 bu. of grain per acre as compared with 24.94 bu. per acre on ground plowed August 15, and 13.62 bu. per acre on ground plowed September 15. Ground plowed 3 in. deep in July produced 10.92 bu. less wheat than ground plowed 7 in. deep the same date. Both single and double listing gave smaller yields of wheat than deep plowing.

Early disking was advantageous when the plowing was delayed until September, but no increase in yield resulted when the plowing was done in August. Regardless of method, early working usually produced an increase and late working a decrease in yield. The soil moisture content at seeding time seemed to bear practically no relation to the yield of wheat. The amount of soil moisture at seeding time was found to be increased more by the size of the preceding crop than by the method of preparing the ground.

Early plowing and thorough working of the soil were found to liberate large quantities of nitrates, and in 1911 and 1913 there was a close correlation between the amount of nitrates in the soil at seeding time and the yield of wheat. While not in direct proportion, yet large yields were only obtained when nitrates were present in large quantities and small yields were usually secured when nitrates were low. Moisture was more completely used by the crops on the plats containing a large supply of nitrates at seeding time, and there was considerable evidence to show that moisture was more economically used in the presence of a large supply of nitrates. Nitrogenous fertilizers did not increase the yield of wheat on ground rich in nitrates plowed in July, while on disked corn ground the nitrogenous fertilizer increased the yield of wheat nearly 100 per cent.

The general conclusion is drawn that apparently early plowing in preparing land for winter wheat is of value principally because of the large supply of plant food liberated, especially nitrates, rather than from any other cause, and that poor results are secured from late plowing chiefly because plant food is not made available in sufficient quantities.

The progressive development of the wheat kernel, II, R. W. THATCHER (*Jour. Amer. Soc. Agron., 7 (1915), No. 6, pp. 273–282*).—This article reports the continuation of work previously noted (E. S. R., 31, p. 234).

The varieties of wheat used in these trials were of the Fife, Velvet Chaff, and Blue Stem groups. Harvesting was begun with each group as it reached a particular stage of development, i. e., when it showed the largest proportion of spikes with the anthers of the two central spikelets protruding. Samples were taken every three days. The data show the yield and physical properties of kernels at the successive stages of development; analyses of sample kernels; weights in milligrams of material per kernel; gain in milligrams of protein and carbohydrates in each kernel, with the ratio of the two materials for each period; the relation between the composition of material gained by the kernels and their specific gravity; and the character of the nitrogen-containing compounds in Blue Stem wheat at successive stages of growth.

"The percentage of material matter (ash), ether extract, and crude fiber in the dry matter progressively decreases. The percentage of sugars also decreases, but much more rapidly during the early stages of development than after the 'milk' stage, from which time on the decrease is very slight. The percentage of protein in the dry matter decreases slightly until about the milk stage and then begins to increase, the final matured sample usually showing a higher percentage than the very immature ones.

"The actual quantity of all these materials in the kernels increases during each successive period of growth, with the exception of sugars, of which there is an actual decrease as the kernels develop, undoubtedly by reason of their conversion into reserve starch. The carbohydrate-protein ratio is at first greater and then diminishingly less in the developing kernels than in the 'mold' or pericarp material into which the endosperm material is filled. The observed changes in composition of the entire kernel are due, in part at least, to changes in the relative proportions of endosperm, pericarp, and germ, these being parts of the kernel which possess entirely different functions, and correspondingly different chemical composition."

On the effect of using many parallel plats in field experiments, O. DE VRIES (*Teysmannia, 26 (1915), No. 8–9, pp. 465–474*).—This article discusses the use of replicate plats in reducing the probable error in experimentation.

HORTICULTURE.

Report of horticulturist, C. C. NEWMAN (*South Carolina Sta. Rpt. 1915, pp. 13–20*).—A brief progress report on the work of the horticultural division.

Some data were secured in connection with the apple breeding work (E. S. R., 32, p. 538) which show that apples from certain trees of standard varieties may keep better and remain firm and crisp much longer than apples from other trees of the same variety. In the tests here reported two boxes of apples from each of three distinct types of the Black Twig variety and also two boxes of Kinnard apples were gathered from two distinct types of this variety. The fruit was wrapped in paper, placed in boxes, and stored away in a cool cellar. The apples were carefully inspected and repacked every 30 days beginning on December 15. On May 1 one type of the Black Twig showed 3 per cent loss, the second type 40 per cent loss, and the third type 14 per cent loss. Of the two types of Kinnard, one was in perfect condition on December 15 and the other showed a loss of 2 per cent. On February 15 the first type showed 13 per cent loss and the second type 38 per cent loss. Work is under way to determine whether these particular characteristics will be inherited. A record is given of the yield of eight Kinnard trees for the 6-year period, 1909 to 1914. The trees were all the same age, being six years old when the test was begun and growing under similar conditions. Certain of these trees were found to fruit regularly while other trees of the same variety fruited only every other year.

In the work of testing fruit varieties quite a number of varieties growing in orchards have been collected from all parts of the State. Some of these varieties which appear to be especially valuable are being tested at the branch stations.

The breeding and selection work with Irish potatoes was continued. By selecting different strains of the varieties giving the best results for the second or fall crop the station now has a number of types well adapted for growing in the late summer and early fall. The strain of Lookout Mountain previously selected for its keeping qualities under ordinary storage (E. S. R., 32, p. 538) gave good results during the past season, 98 per cent of the tubers planted

producing strong plants. This variety produces large clusters of seed pods on every flower stem, hence offers opportunities for breeding work.

Investigations with the Rotundifolia grapes were continued. By forcing a number of varieties to bloom and set fruit out of season, at the same time preventing the male vines from flowering, evidence was secured which indicates that varieties of the Rotundifolia grapes are not dependent on the pollen from male vines for the development of normal fruit. It was also found that bees apparently ignore the flowers of the Rotundifolia grapes, hence play little, if any, part in their pollination in the region of the station.

Variety and cultural tests of fruits and vegetables were conducted by the Pee Dee substation, and also variety tests of fruit at the Coast substation during the year.

The Lamao Experiment Station, P. J. Wester (*Philippine Agr. Rev.* [*English Ed.*], *8* (*1915*), *No. 2, pp. 65–80, pls. 4*).—An account of the Lamao Experiment Station with special reference to progress made in the various projects since the reorganization of its work in 1913. A brief summary is given of work accomplished on the following projects: Tropical fruits, citrus fruits, pineapples, avocados, mangoes, papayas, spices, nursery work, tropical root crops, vegetables, seed growing, apiculture, live stock, maintenance, and extension.

Somatic segregation, E. J. Kraus (*Jour. Heredity, 7* (*1916*), *No. 1, pp. 3–8, figs. 2*).—A paper read before the American Genetic Association at Berkeley, Cal., August 5, 1915.

The author gives a number of examples of two classes of variations in plants, one of which breeds true while the other does not. The slow progress thus far made in improvement through bud selection is attributed to the failure to take into account the occurrence of both fluctuating variations and constant variations. The work of Shamel with citrus fruits (E. S. R., 34, p. 43) is pointed out as a striking case in which true segregates or mutants appear to have been utilized.

The garden and farm almanac for 1916, edited by E. L. D. Seymour (*Garden City, N. Y.: Doubleday, Page & Co., 1916, pp. 200, figs. 98*).—A reference book and annual for the farm, garden, and country home. Among the special features are a monthly calendar of operations, garden and farm building plans in blue print, directories of national organizations having to do with the various phases of agriculture, a state directory of agricultural activities, a bibliography of books and bulletins of 1915 on farm, garden, and country life subjects, concise directions for the control of diseases and pests of fruits, vegetables, and ornamentals, a guide to farm and garden weeds, a planting table for vegetables, and information on the more important breeds of farm animals.

Two farm gardens, C. A. Keffer (*Col. Agr. Univ. Tenn., Ext. Div. Pub. 11* (*1915*), *pp. 15*).—This bulletin contains plans for two gardens, one of a dozen vegetables to be grown on not more than one-fourth acre of land, and the other to include an acre of land devoted to vegetables, small fruits, and orchard fruits.

The home vegetable garden, H. F. Tompson (*Facts for Farmers* [*Mass. Agr. Col. Ext. Serv.*], *5* (*1915*), *No. 5, pp. 4*).—This pamphlet contains brief practical suggestions for planning and managing the home vegetable garden, including a vegetable planting table.

[Experiments in growing vegetable seeds at the Central Experimental Farm in 1915], M. B. Davis (*Agr. Gaz. Canada, 3* (*1916*), *No. 1, pp. 12–18, figs. 7*).—Experiments in raising beet, carrot, celery, and cabbage seeds, conducted at the Central Farm, Ottawa, are reported. Information is given relative to methods of storing and planting the seed stock and harvesting and cleaning the seed, together with results secured in 1915.

Many of the varieties were grown under cotton covers to keep them from crossing, thus tending to reduce the yield. The following results were secured: Sixty-six cabbage plants yielded a total of 2 lbs. 9 oz. of seed with an approximate retail value of $5.20; 186 celery plants yielded 9 lbs. 9 oz. of seed valued at $43.87; 176 carrot plants yielded 9 lbs. 12 oz. of seed valued at $16.06; and 113 beet plants yielded 40 lbs. 9 oz. of seed valued at $50. Germination tests of the seed, as far as they were completed, gave satisfactory results.

Experiments with cabbage, C. E. Myers (*Pennsylvania Sta. Bul. 137 (1916), pp. 3–15, fig. 1*).—This bulletin reports a number of cultural experiments with early and late cabbage conducted at the station during the past few years.

In view of the practice in Pennsylvania of sowing seed for early cabbage plants between the middle of January and the middle of February, a comparative test was made of Jersey Wakefield cabbage seed sown on January 15 and on February 15 and transplanted to the cold frame about a month later in each case, both lots of plants being set in the field on the same date. The early-sown seed gave an increase in earliness of 12 per cent at the first cutting, and of 20 per cent for the first third of the cutting season.

A test of large *v.* small plants for a number of years showed practically no difference in earliness or in productiveness between large and small plants of early cabbage, regardless of whether the grading was done at the time of the first transplanting or when the field planting was done.

A comparative test of planting distances resulted in a gain of $12.03 per acre when Jersey Wakefield was planted in rows 24 in. apart and the plants set 18 in. in the row, and a loss of $10.03 per acre when Early Spring was set at this distance as compared with planting in rows 28 in. apart and the plants set 18 in. in the row. The variety Copenhagen Market which was tested for one year gave the most profitable yield when planted in rows 28 in. apart and the plants set 15 in. in the row.

Late cabbages did best when only large vigorous plants with sufficient vitality to withstand possible unfavorable conditions were planted. Late cabbage planted 32 by 18 in. and cultivated one way gave better results than when it was planted in check rows 32 by 32 in. and cultivated both ways.

Influence of rainfall on the composition of tomatoes, W. D. Bigelow (*Amer. Food Jour., 11 (1916), No. 2, pp. 58, 59; Canner, 42 (1916), No. 2, pp. 14, 16*).—Laboratory studies were conducted by the National Canners' Association during 1914 and 1915 to determine what relation, if any, exists between the water content of tomatoes and the rainfall. Fruits were secured throughout the season, both from the Arlington Experimental Farm and from the Maryland Experiment Station. The seasons were somewhat unfavorable for the study, since in both years the rainfall was higher before the tomato season than during the season and the ground was well saturated at the time the tomatoes began to ripen.

The data as a whole, however, show a general tendency for the soluble solids to decrease in amount as the season advances. The soluble solids of the various varieties of tomatoes examined were highest when the fruit began to ripen on the plants and lowest with the last fruit of the season. It is suggested that this decrease in solids with the advancing season may have been due to causes quite distinct from the rainfall. It also appears improbable that the watery condition of tomatoes observed by canners after a heavy rain is due to a greater percentage of water in the tomatoes but rather to a change in the structure of the tomato so that it does not hold its juice as readily as when grown under normal conditions. Tomato juice released from tomatoes during abnormal conditions can readily be distinguished by the chemist from water which is added to the tomatoes during the course of canning

Careful handling, precooling, and cold storage investigations (*Brit. Columbia Rpts. Dept. Agr., 8 (1913), pp. 37, 38*).—A brief summary of a number of investigations conducted during 1913, with E. Smith in charge.

Investigations relative to losses from decay in rhubarb shipments show that the decay is due primarily to a bacterial organism, followed by attacks of some parasitic fungi. Certain varieties of rhubarb are more susceptible than others. Rhubarb from new and rich soil was most attacked and that from upland old soil the least attacked. Cold storage tests thus far made showed that decay may be completely arrested at proper temperatures.

Precooling and shipping experiments with strawberries, raspberries, and apples are also briefly noted.

Careful handling, precooling, cold storage, and transportation investigations (*Brit. Columbia Rpts. Dept. Agr., 9 (1914), pp. 84–86*).—An account of investigations conducted during 1914 in charge of E. Smith, succeeded by F. L. Goodman, and later by H. Thornber.

In continuation of the above-noted work with rhubarb, an experimental study was made of methods of packing. The results indicate that rhubarb should not be washed before shipment and should be shipped dry. The leaves should be entirely removed before shipping.

In the work with strawberries and raspberries, previous experiments had demonstrated that the berries should not be precooled much below 60° for ordinary express shipments, so the precooling work was abandoned and experiments in drying the fruit with a dehydrator were carried on. Experimental shipments of dry and wet fruit showed conclusively that proper fanning greatly increases the shipping quality of both strawberries and raspberries. Where it is neecssary to pick fruit slightly wet, it can be readily dried and its shipping quality made superior to the best ordinary shipments by fannng with an electric fan in a suitable chamber for about one hour.

Cost records made on the department's precooling plant show that when ice costs $3 per ton, the cost of precooling peaches or apricots is 1.9 cts. per box. The precooling plant in use is described.

The work already conducted in the cold storage experiments with apples, which have been under way for three years, indicates that only small and medium-sized apples should be used for storage. The proper stage of maturity for storage varies with different varieties. Delay in getting apples into cold storage is dangerous. There was little difference in the cold storage qualities between fruits from various districts. The commercial season of varieties such as Jonathan and McIntosh can be extended to February, and even to March, by cold storage.

Some storage experiments with onions were started during the year.

Maturity of fruits for precooled shipments, E. Smith (*Agr. Gaz. Canada, 3 (1916), No. 1, pp. 18–20, pl. 1*).—A discussion of the proper degree of maturity at which fruit should be picked for precooled shipments, based upon precooling experiments conducted by the Canadian department of agriculture.

New fruits originated at Minnesota Fruit Breeding Farm, C. Haralson (*Minn. Hort., 44 (1916), No. 2, pp. 79–83, figs. 3*).—In this paper the author calls attention to a few of the most promising new varieties of fruits originated at the state fruit farm. Attention is directed in particular to improvements in strawberries, raspberries, plums, and grapes.

Varieties of fruit for West Virginia, W. H. Alderman, L. F. Sutton, and R. R. Jeffries (*W. Va. Univ., Agr. Ext. Dept. Circ. 46 (1915), pp. 8*).—This comprises lists of selected varieties of orchard and small fruits recommended by the West Virginia University and Station for general planting in the State.

Economics of apple orcharding, C. I. LEWIS and H. A. VICKERS (*Oregon Sta. Bul. 132 (1915), pp. 104, figs. 14*).—The division of horticulture of the station has been conducting inquiries for four years concerning the cost of fruit production in the Pacific Northwest. As a result of this work some data were obtained from about 1,000 orchards, more or less complete data having been secured from about 500 orchards located in Oregon, Washington, Idaho, and British Columbia. The purpose of the present bulletin is to present average costs of production, based on this inquiry, which will serve as an aid to those orchardists attempting to lower their production costs and which will indicate what expenses may be included under the various headings of growing, handling, overhead charges, and selling. The figures used are taken from farms which have at least two-thirds of their entire acreage devoted to orchards and at least two-thirds of this orchard devoted to apples. In addition to a study of cost of production based on averaged data, examples are given of actual production costs on various types of orchards. The various factors entering directly into the cost of production are discussed, and consideration is also given to diversified farming in relation to lowering the cost of fruit production.

From the data secured as a whole it appears that the average cost of clearing land and planting to apples in the Northwest is about $112.82 an acre. The average cost of maintenance and development of orchards 2 to 3 years of age is $62.72 an acre; 4 to 5 years of age, $60.36 an acre; and 6 to 7 years of age, when some returns were received, $52.87 an acre. The average cost of production of apples in orchards 6 to 9 years old with an average yield of 120 bu. per acre was $140.92, or $1.18 a box. The average cost of production of apples in orchards 10 to 18 years old with an average yield of 233 boxes to the acre was $220.50 per acre, or 95 cts. per box.

The average fruit ranch was found to contain too many horses for economical management. Apples were produced much cheaper on the larger units than on the smaller units, and it is concluded that those growers who are depending on 5 or 10 acres of apples should either enlarge their orchards or combine with apple production some other agricultural activities. It is believed that the choice of varieties for the Northwest should be reduced to a dozen and that each locality should only produce those few varieties that are best suited for local conditions.

With reference to crop diversification, the authors conclude that the best opportunities to diversify the apple farm, especially where lands are high-priced and where there is an overhead cost, taxes, and interest on the investment of from $30 to $50 an acre, is by the growing of more than one kind of fruit in addition to raising the home supply of vegetables, pork, poultry, milk, and all necessary stock feed. A number of growers are handling forage crops to advantage where the crop is fed to live stock on the place. When such crops are grown for hay in the orchard, however, the increased cost of producing the hay under such conditions leaves only a narrow margin of profit.

The raising of truck and garden crops in the orchard will prove profitable only in exceptional cases if it is necessary to hire labor for all work. Where irrigation is practiced the strawberry is one of the most successful crops grown among trees in the Northwest. Potatoes have been tried as an intercrop with varying success. Where conditions were favorable for cheap and abundant pasturage and where most of the concentrates necessary may be raised on the farm or obtained at a reasonable price, hogs have proved a profitable investment with orcharding. Dairying will not prove profitable in conjunction with orcharding in the Northwest unless the orchardist procures a superior herd and produces on the ranch the major portion of all feed consumed.

Economics in apple orcharding, C. I. Lewis and H. A. Vickers (*Nebr. Hort., 5 (1915), No. 9, pp. 1–5, 7*).—A popular summary of the above noted bulletin.

Packing and shipping peaches in Georgia carriers, M. A. Blake and C. H. Connors (*New Jersey Stas. Bul. 284 (1915), pp. 3–48, figs. 27*).—This bulletin discusses the advantages and disadvantages of different packages used for peaches, and describes in detail packing house equipment for peaches and methods of grading, packing, and shipping in six-basket Georgia carriers, including information relative to the proper degree of maturity at which different varieties of peaches should be picked. The text of the New Jersey laws affecting the size and marking of peach packages is also included.

New or noteworthy tropical fruits in the Philippines, P. J. Wester (*Philippine Agr. Rev. [English Ed.], 8 (1915), No. 2, pp. 103–114, pls. 4*).—The author here calls attention to a number of species of fruit trees that are comparatively little known in the Western Hemisphere and to others which are apparently new to horticulture or not well-known even in the Far East outside of the Philippines. See also a previous note (E. S. R., 28, p. 236).

Improving the production of Washington navels, A. D. Shamel (*Cal. Cult., 46 (1916), Nos. 1, pp. 1, 2, figs. 2; 2, pp. 36–38, figs. 3; 3, pp. 70, 71, fig. 1; 4, pp. 101, 102; abs. in Fla. Grower, 13 (1916), No. 2, pp. 10, 11, figs. 3; Jour. Heredity, 7 (1916), No. 2, pp. 82–87, fig. 1*).—A popular account of the author's work in California in improving the yield of Washington navel oranges through bud selection and top working (E. S. R., 34, p. 43).

Problems in walnut breeding, L. D. Batchelor (*Jour. Heredity, 7 (1916), No. 2, pp. 61–65, figs. 2*).—A discussion of the walnut industry in California with reference to walnut blight, variability of the present seedling groves, and improvement through selection of profitable and resistant varieties.

Horticultural sports, W. H. Manning (*Nat. Nurseryman, 24 (1916), No. 2, p. 56*).—The author calls attention to a large number of ornamental plant sports and briefly discusses their use in landscape gardening.

House plants: Selection, propagation, and care, E. Hansen (*Utah Agr. Col., Ext. Div. Circ., 4 (1916), No. 4, pp. 12, figs. 7*).—A popular treatise on the propagation and care of house plants, including suggestions relative to varieties of house plants that give the best results.

Analyses of materials sold as insecticides and fungicides, C. S. Cathcart and R. L. Willis (*New Jersey Stas. Bul. 286 (1915), pp. 3–13*).—This bulletin contains analyses of 68 samples of Paris green, lead arsenate, lime-sulphur, Bordeaux, and miscellaneous materials sold in New Jersey during 1915.

FORESTRY.

Forest trees worth planting.—Red oak (Quercus rubra), E. Secrest (*Mo. Bul. Ohio Sta., 1 (1916), No. 2, pp. 54–60, figs. 3*).—This article discusses the red oak (*Q. rubra*) with reference to its important characteristics, planting and cultivation, value for shade and ornament, and treatment when planted as a street tree.

Seed and germination in Hevea brasiliensis, A. Sprecher (*Bul. Jard. Bot. Buitenzorg, 2. ser., No. 19 (1915), pp. 112, pls. 7, figs. 15*).—Part 1 of the work contains a general account of the organs and process of reproduction in Hevea, together with a detailed description of the seed and a discussion of seed anomalies. Part 2 deals with normal germination in Hevea and germination anomalies. Part 3 contains a detailed account of germination experiments with Hevea seed, in which consideration is given to the influence of the factors of position of seed in the soil, light, moisture, soil characteristics, and tapping or

not tapping of the mother tree on the germination energy of the seed and germination power, on the formation of knees and rings on the seedlings, on the development of complicated curves in the seedlings, and on the length of month-old plants.

The study was conducted according to biometrical methods. The results are presented in a series of tables and fully discussed.

A silvicultural system for western yellow pine in the Black Hills, P. T. SMITH (*Proc. Soc. Amer. Foresters, 10 (1915), No. 3, pp. 294–300*).—The systems here recommended and discussed are the shelterwood system for even-aged stands and the group-selection system for mixed-aged stands.

Influence of the weather on the height growth in pine A. P. TOLSKIĬ (*Trudy Lfiesn. Opytn. Dfielu Ross., 47 (1913); abs. in Zhur. Opytn. Agron. (Russ. Jour. Expt. Landw.), 15 (1914), No. 1, pp. 106, 107*).—The author reports a study conducted in the Borov Experiment Forest in the Government of Samara relative to the height growth of pines as influenced by meteorological conditions during different seasons of the year.

Some uses of meteorological studies in silvicultural and management problems, W. H. KENETY (*Proc. Soc. Amer. Foresters, 10 (1915), No. 3, pp. 266–270*).—Some of the results obtained at the Cloquet forest station on studies of meteorological factors and their influence on forest types are given under the heads of air temperature, soil temperature, and soil moisture. The moisture equivalent method for determining soil types (E. S. R., 19, p. 416) has been found at the station to be the most usable one. The application of this method is here described.

The reforestation of brush fields in northern California, R. H. BOERKER (*Proc. Soc. Amer. Foresters, 10 (1915), No. 3, pp. 284–293*).—This paper describes in detail an apparently successful operation in reforesting a brush area by planting, the absence of seed trees making the process of natural regeneration a difficult one.

Windfall damage in selection cuttings in Oregon, K. SMITH and R. H. WEITKNECHT (*Proc. Soc. Amer. Foresters, 10 (1915), No. 3, pp. 263–265*).—A detailed study of 3,621 windfalls, 2,160 of which were yellow pines, was conducted on nearly 4,000 acres of cut-over land in order to determine the principles which control windfall.

The results of the investigation show in substance that no diameter class above 12 in. is immune from wind-throw, the liability increasing with the diameter. The danger of wind-throw increases with the height of the trees, the density of the crown, and with the grouping of trees as opposed to their even distribution. The character of the trunk of the trees has very little effect upon their wind firmness. Windfall is apparently as great on medium and deep soils as on shallow soils, and is more prevalent on cut-over land than in virgin timber. It occurs indiscriminately without regard to slope or exposure, but is slightly more severe on ridge tops and lee slopes than elsewhere.

The trees of Texas, I. M. LEWIS (*Bul. Univ. Tex., No. 22 (1915), pp. VI+169, figs. 48*). An illustrated manual of the native and introduced trees of the State. The descriptions given are based largely upon specimens in the herbarium of the University of Texas. The discussion of each species includes its distinguishing characteristics, range, and uses. A key is given to the families and genera included.

The forests of Alaska, H. S. GRAVES (*Amer. Forestry, 22 (1916), No. 265, pp. 24–37, figs. 16*).—A descriptive account of the forests and forest conditions in Alaska, in which the author calls special attention to the relation of the National Forests to the development of industries in Alaska.

The forests of central British Columbia, H. R. CHRISTIE (*Forestry Quart., 13 (1915), No. 4, pp. 495–503*).—A short descriptive account of the forests and timber resources of central British Columbia.

Forest investigations in Canada.—Proposal for a national organization for technical investigations, W. N. MILLAR (*Forestry Quart., 13 (1915), No. 4, pp. 504–521*).—The author considers the present status of the forestry profession in Canada, and outlines the scheme whereby the Dominion Forestry Branch plans to undertake the investigation of the forestry problems of Canada and to coordinate the technical work of all Canadian forest organizations.

Working plans: Past history, present situation, and future development, B. MOORE (*Proc. Soc. Amer. Foresters, 10 (1915), No. 3, pp. 217–258*).—In this paper the author reviews the past history and present conditions of governmental forest working plans and discusses the probable future development of working plans.

The use of the plane table in making forest maps, S. B. LOCKE (*Forestry Quart., 13 (1915), No. 4, pp. 445–456, pls. 3*).—A discussion of the application of plane table methods of mapping to mountainous countries with broken cover.

The profile alidade, an instrument that may prove useful in mapping strip lines, S. B. DETWILER (*Forestry Quart., 13 (1915), No. 4, pp. 437–441, pl. 1, figs. 2*).—The author describes the application of the profile alidade in mapping forest strip lines. As a result of test lines run over several areas it is concluded that the alidade promises greater speed and accuracy than the Abney hand level (E. S. R., 33, p. 843).

Saving labor in measuring heights.—A new principle applied to the hypsometer, S. B. DETWILER (*Forestry Quart., 13 (1915), No. 4, pp. 442–444, figs. 3*).—The author here describes and illustrates an adjustable sighting arm, applied to a hand hypsometer, which automatically remains fixed on the point to which it is set and permits of the free movement of the principal sighting arm without affecting the accuracy of measurement.

Further notes on frustum form factor volume tables, D. BRUCE (*Proc. Soc. Amer. Foresters, 10 (1915), No. 3, pp. 315–321, figs. 2*).—In continuation of previous investigations (E. S. R., 27, p. 348; 31, p. 640) the author here shows the applicability of the frustum form factor method to Douglas fir, western larch, and Engelmann spruce. Some short-cut methods of constructing frustum form factor volume tables are also given.

The use of frustum form factors in constructing volume tables for western yellow pine in the Southwest, C. F. KORSTIAN (*Proc. Soc. Amer. Foresters, 10 (1915), No. 3, pp. 301–314, figs. 3*).—The author here reports an experimental trial of the frustum form method of constructing volume tables, advocated by Bruce as noted above. From the work conducted with yellow pine it is concluded that the frustum form factor method is more adaptable for constructing local volume tables and much cheaper than the conventional method.

The application of reconnaissance data to the problem of marking timber for cutting, R. H. BOERKER (*Forestry Quart., 13 (1915), No. 4, pp. 457–464*).—A study of data secured from reconnaissance work in pure western yellow pine stands with reference to its application to the management of these stands.

A system of cost accounts for a forest tree nursery, B. A. CHANDLER (*Forestry Quart., 13 (1915), No. 4, pp. 468–471*).—The system is described, including a sample work report and ledger account.

Table for determining profits in holding second growth, W. D. STERRETT (*Forestry Quart., 13 (1915), No. 4, pp. 472, 473*).—The table here given is applicable to second growth stands which can be purchased at given prices per

acre and also to mature timber which is increasing in yield or value per acre by allowing it to stand.

Close forest utilization with a portable mill, E. A. ZIEGLER (*Forestry Quart., 13 (1915), No, 4, pp. 465–467*).—This comprises an accurate record of income and expense, kept by L. E. Staley, in an operation on the Mont Alto (Pennsylvania) State Forest.

The present forest tax situation in New Hampshire, J. H. FOSTER (*Forestry Quart., 13 (1915), No. 4, pp. 474–480*).—A comparative study of 126 distinct and widely scattered timber lots, mostly second growth white pine, with reference to tax assessments and timber conditions in 1908 as compared with assessments and timber conditions in 1914.

The author concludes, in part, that an assessed valuation in excess of 50 per cent of the actual values on poorly-growing lots or in excess of 75 per cent on good-growing lots will generally cause a loss to the owner unless he cuts the timber at once and will always cause a loss to the town if he does cut. Abrupt increases in taxation cause the owner to cut his timber regardless of his financial advantage.

Forest fires in North Carolina during 1914 and forestry laws of North Carolina, J. S. HOLMES (*N. C. Geol. and Econ. Survey, Econ. Paper 40 (1915), pp. 48*).—The first part of this report contains the annual statement of forest fires for 1914, and shows the results of organized federal fire protection on the Southern Appalachian Purchase Areas, as well as the results of partial protection in several townships adjacent to these areas.

The second part of the report gives a résumé of forest laws in North Carolina, including the text of the new forestry laws enacted by the general assembly of 1915. These include laws for the protection of forests from fire; for the protection of watersheds; the creation of state forests, enabling the federal acquirement and control of land for National Forests; and the Arbor Day law.

Organization of cooperative forest fire protective areas in North Carolina, J. S. HOLMES (*N. C. Geol. and Econ. Survey, Econ. Paper 42 (1915), pp. 31*).—An account of the proceedings of a special conference held by the state forester in 1915 to secure the cooperation of local landowners and other interested parties preliminary to the arrangement of cooperative measures between the Federal Government and the State Geological Board in forest fire protection. As a result of this conference several cooperative forest fire protective areas or districts have been organized.

Some factors governing the trend and practice of forest sanitation, J. R. WEIR (*Forestry Quart., 13 (1915), No. 4, pp. 481–489*).—The author here discusses some of the factors governing the trend and practice of forest protection with special reference to fungus diseases.

DISEASES OF PLANTS.

The grouping and terminology of plant diseases, L. E. MELCHERS (*Phytopathology, 5 (1915), No. 6, pp. 297–302*).—The author suggests the classification of plant diseases into three groups, nonparasitic diseases, diseases of unknown origin, and parasitic diseases, these terms to supplant the terms physiological diseases, diseases of unknown origin, and fungus and bacterial diseases, which are in common use.

Seed and soil treatments for plant diseases, J. G. HUMBERT (*Mo. Bul. Ohio Sta., 1 (1916), No. 2, pp. 43–46*).—Suggestions are given for different seed and soil treatments for various plant diseases.

Copper sprays, H. FONZES-DIACON (*Compt. Rend. Acad. Sci. [Paris], 160 (1915), No. 16, pp. 528–530*).—The author summarizes his account of a study carried out by himself on the comparative fungicidal values of copper sprays with the claim that strongly acid mixtures are rich in tetracupric sulphate. They also contain the components of that ingredient in addition to copper sulphate, and possess, therefore, a high fungicidal value, while the neutral mixtures contain less, and the alkaline preparations but little of that ingredient. The alkaline preparations tend, moreover, to the formation of the less effective compounds of copper.

Bordeaux and Burgundy mixtures, H. FONZES-DIACON (*Prog. Agr. et. Vit. (Ed. l'Est-Centre), 36 (1915), No. 18, pp. 416–419*).—Directions and suggestions are given regarding the preparation and use of spraying mixtures in accordance with the data set forth by the author in the article above noted.

Report of the botanist and plant pathologist, H. W. BARRE (*South Carolina Sta. Rpt. 1915, pp. 21–26*).—A progress report is given on the various projects, in plant diseases, conducted under the Adams fund, and continuing previous work (E. S. R., 32, p. 543).

Continued investigations on the effect of hot-water treatment of cotton seed for the prevention of anthracnose have proved quite successful. In one field of 12 acres only about 1 per cent of the bolls showed any injury at the end of the season, while from the same seed, untreated, 15 per cent of the bolls were destroyed. In a field where the same cotton was grown the previous year, 45 per cent of the bolls were destroyed. In connection with this investigation, it was found that the seed of different varieties of cotton varied in respect to the temperature they could withstand, some varieties being killed at 72° C., while others stood a temperature of 76°.

In addition to the hot-water treatment, some spraying experiments were conducted in which Bordeaux mixture, lime sulphur, and bichlorid of mercury were tested. The amount of anthracnose was so considerably reduced that it is intended to repeat the experiment another season. It is not expected, however, that spraying cotton will prove an economical method of preventing anthracnose, it being considered applicable only as an additional means of securing clean seed for planting.

The investigation on the relations of moisture content and shedding of bolls has been continued, and an attempt is being made to determine at what season the cotton plant needs most water. The 20 pot plants worked with used considerably the most water in August. Data are also being collected on the time it takes cotton to mature in this climate, from 24 to 30 days elapsing from the first appearance of the squares until the flowers open, and from 55 to 65 days from blooming to the opening of the bolls.

On the bacterial diseases of cotton, the work has been conducted by F. M. Rolfs, who has made a study of the angular leaf spot caused by *Bacterium malvacearum*. It is reported that seed treatment and spraying tests gave some very satisfactory results.

Among the miscellaneous notes given, the author reports the serious loss caused to corn by *Physoderma* sp., the presence of a species of Sclerotinia on alfalfa, and the work on cotton and cowpea wilt and root knot carried on in cooperation with this Department.

Administration report of the government mycologist for 1913–14, W. MCRAE (*Rpt. Dept. Agr. Madras, 1913–14, pp. 49, 50*).—It is stated that the bud rot of coconut palms found late in the previous year in Malabar has been shown to be caused by *Pythium palmivorum*. The characteristic signs of bud rot have been obtained by inoculation of young palmyra palms with the fungus from diseased older trees.

The mahali or koleroga disease of areca nut palms, due to *Phytophthora omnivora*, was not so severe this year, so that the contrast between trees sprayed with Bordeaux mixture and unsprayed trees was not so great as formerly.

Successful inoculations were obtained with the grain smut (*Cintractia sorghi vulgaris*) and head smut (*Ustilago reiliana*) on Guinea corn.

[Plant diseases in New South Wales in 1913–14], G. P. DARNELL-SMITH (*Rpt. Dept. Agr. N. S. Wales, 1914, pp. 32, 33*).—It is stated that the disease due to *Colletotrichum glœosporioides*, known locally as brown spot, has caused serious loss in case of Emperor mandarin trees in the Gosford district. Thorny mandarin has resisted infection in the field though not in the laboratory. The former variety is cropped continuously, the latter biennially. The disease appears likely to become a serious pest. It is found on stems, leaves, and fruits. Black spot of oranges due to *Phoma citricarpa* is still prevalent. *Armillaria mellea* has done considerable damage to citrus trees.

The finding of fructifications of *Sphæropsis malorum* permitted the identification of this fungus as the cause of an apple canker in two localities. *Glœosporium* sp., another cause of canker, was also prevalent during the year. It is thought the several forms of Glœsporium formerly regarded as distinct are really modifications of the same species. This fungus has caused much damage to several fruits, especially to passion fruit, on which it is known as brown spot, and inoculations from which cause bitter rot in several other fruits.

Wheat mildew (*Erysiphe graminis*) has been somewhat prevalent. Bunt, or stinking smut (*Tilletia tritici* and *T. levis*), is still found on inferior wheats. No better treatment has been found for seed wheat than that already noted by Ross (E. S. R., 32, p. 49). The same treatment checks flag smut (*Urocystis tritici*). Examples of faulty germination have shown the presence of a fungus apparently new, provisionally assigned to the Podosporiella.

Black rot of cabbage due to *Pseudomonas campestris* has been noted.

Black spot, common among tomatoes and generally associated with bacteria and *Macrosporium* sp., seems to be dependent also upon drought conditions, the plant developing a natural immunity when given sufficient water.

Bunt or stinking smut of wheat, F. D. HEALD and H. M. WOOLMAN (*Washington Sta. Bul. 126 (1915), pp. 3–24, pls. 4, fig. 1*).—The results of an investigation, in cooperation with the Office of Cereal Investigations of the U. S. Department of Agriculture, of stinking smut of wheat due to *Tilletia tritici* are given. The authors discuss the causes of the disease, the effect of the smut, and methods of invasion and of control. This disease is quite serious in the Northwest, in some instances causing almost total destruction of crops.

Marked variation in susceptibility of varieties to stinking smut is noted, and it is thought that probably their use will offer partial relief from serious loss. Investigations show that the smut spores are blown to a considerable distance, thus interfering with the usual methods of control. The authors recommend treatment of the seed wheat, unless it is known to be free from the smut, with either formalin or copper sulphate, the latter being preferable for Washington conditions. Early seeding or late fall planting are recommended as additional methods of control, and where possible crop rotation should be followed.

A Podosporiella disease of germinating wheat, P. J. O'GARA (*Phytopathology, 5 (1915), No. 6, pp. 323–326, pls. 2*).—A detailed account is presented of a disease of germinating wheat, a preliminary notice of which has already been given (E. S. R., 33, p. 847). The fungus causing this disease is said to be *P. verticillata* n. sp., a technical description of which is given.

An anthracnose-resistant Red Kidney bean, M. F. BARRUS (*Phytopathology, 5 (1915), No. 6, pp. 303–311, figs. 4*).—In a previous publication (E. S. R.,

26, p. 747), the author stated that he had not found any varieties of *Phaseolus vulgaris* which were resistant to every strain of bean anthracnose. In the present paper a strain of Red Kidney is described which has been under observation for three seasons and which seems to have marked resistant qualities.

Plantings in greenhouse and in garden were made of the resistant variety, which is called Wells Red Kidney, and of a number of other varieties, all being then inoculated with four distinct strains of the fungus *Colletotrichum lindemuthianum*. In these experiments the vines of Wells Red Kidney stood up well and produced well-filled pods, while all the other varieties were seriously infected.

This variety seems to be a distinct strain which was originated in New York about 1903 or 1904. While quite resistant to anthracnose, it is not resistant to the bacterial blight caused by *Bacterium phaseoli*, the brown rot due to *Sclerotinia libertiana*, or to any of the root rots common in parts of New York.

Notes on an internal disease of cotton seed, W. L. BALLS (*Agr. News* [*Barbados*], *14* (*1915*), *No. 350, p. 314*).—This article gives results and conclusions from observations made in Egypt on cotton seed in which the percentage of failures to germinate was found to be proportional to the time during which the seed cotton had been hanging in the bolls, and in which for equal periods of exposure the severity of the damage was proportional to the number of stainer bugs present. The author states that probably the damage done by these bugs was due less to their removal of nutrient materials than to the poisons they leave behind, that fungi and bacteria may enter through the punctures and cause complications, and that on the same plant seeds and bolls may be affected in both these ways and also by specific parasites.

Further studies on peanut leaf spot, F. A. WOLF (*U. S. Dept. Agr., Jour. Agr. Research, 5* (*1916*), *No. 19, pp. 891–902*).—In continuation of a previous publication (E. S. R., 32, p. 546), the author reports investigations carried on at the Alabama College Experiment Station to determine the means by which the leaf spot disease is distributed and to test methods for control. It is stated that as the fungus *Cercospora personata* is distributed by winds and insects, rotation and seed disinfection are not entirely successful in controlling this trouble, which at times may decrease the yield from 5 to 20 per cent.

The native habitat of Spongospora subterranea, G. R. LYMAN and J. T. ROGERS (*Science, n. ser., 42* (*1915*), *No. 1096, pp. 940, 941*).—The authors report the occurrence of powdery potato scab on tubers obtained from Peru. Some of the infected tubers were secured from regions where potatoes had never been imported, only the original native varieties being grown. This is considered to indicate that the native habitat of *S. subterranea* is in South America, which is also the home of the potato.

Connection of a bacterial organism with curly leaf of the sugar beet, R. E. SMITH and P. A. BONCQUET (*Phytopathology, 5* (*1915*), *No. 6, pp. 335–342, pl. 1, fig. 1*).—In a previous publication (E. S. R., 33, p. 743), the authors called attention to the presence of specific lesions in sugar beet leaves affected with curly top, and also to the presence of bacteria which resemble *Bacillus dianthi*.

Since the preliminary account a large amount of histological work has been conducted, and the authors find that the organism is a very common inhabitant of the sieve tubes of the sugar beet and that it is not confined to the curly leaf disease. The bacillus is also to be found on seed, but inoculation experiments, either with the juice of diseased plants or with cultures of the organism, have entirely failed.

Curly leaf, it is claimed, may be easily transmitted by grafting and by leaf hoppers. Insects taken from wild plants are not pathogenic, and apparently an incubation period in the body of the insect of no more than 48, and possibly not over 24, hours is necessary before infection can be transmitted.

The comparative effect upon sugar beets of Eutettix tenella from wild plants and from curly top beets, P. A. BONCQUET and W. J. HARTUNG (*Phytopathology, 5 (1915), No. 6, pp. 348, 349, fig. 1*).—The authors briefly report experiments in which 100 specimens of *E. tenella* obtained from a region of California far removed from the sugar beet area, and about 150 individuals which had been living on curly leaf beets, were confined upon healthy plants.

The results show that curly leaf is readily transmitted by insects from infected plants, while with the wild insects the beets remained in a normal condition. Twenty wild insects have been kept on normal beets for a considerable period without producing any effect whatever.

Sweet potato scurf, L. L. HARTER (*U. S. Dept. Agr., Jour. Agr. Research, 5 (1916), No. 17, pp. 787–792, pls. 2*).—An account is given of investigations of the scurf disease of sweet potato first described by Halsted as due to *Monilochætes infuscans* (E. S. R., 2, p. 416). The author gives the results of inoculation experiments and describes certain characteristics of the fungus. As the parasite does not appear to have been definitely published, a technical description of it is given.

A new method of selecting tomatoes for resistance to the wilt disease, C. W. EDGERTON (*Science, n. ser., 42 (1915), No. 1095, pp. 914, 915*).—The author describes a method of growing tomato plants which are resistant to tomato wilt due to *Fusarium lycopersici.* The method consists in the inoculation of sterilized soil with the fungus, after which the seeds are planted and the resistant types selected. In this way a much higher percentage of healthy plants, which may be subsequently set out, is produced than of nonresistant plants, a large proportion of which will be destroyed by the seed bed treatment.

The newer diseases of fruit trees and latest development in their treatment, C. R. ORTON (*Proc. Ann. Conv. Fruit Growers Assoc. Adams Co., Penn., 9 (1913), pp. 77–89, figs. 5*).—It is stated that of the apple diseases known in Pennsylvania, about 20 in number and all but one or two of which are attributed to fungi, 5 or 6 are regarded as of recent appearance in that State. This discussion includes bitter rot (*Glomerella rufomaculans*), blotch (*Phyllosticta solitaria*), Baldwin spot (*Phoma pomi*), blister canker (*Nummularia discreta*), Volutella rot, and collar rot (for which the name collar blight is preferred). Fruit pit (bitter pit or stippen) and water core are also briefly discussed.

Pythiacystis infection of deciduous nursery stock, ELIZABETH H. SMITH (*Phytopathology, 5 (1915), No. 6, pp. 317–322, figs. 4*).—In March, 1914, the author undertook an investigation, a preliminary note of which has been given (E. S. R., 34, p. 353), of the dying back and gumming of peach nursery stock. In this the bark of infected stock was cankered chiefly above the bud, and in advanced cases the bark was girdled from 2 to 6 in. above the graft.

Cultures made from peach showed typical sporangia of *P. citrophthora,* and inoculations were successfully made from peach into apple, pear, peach, almond, and other deciduous nursery stock. Attempts were made to infect the Eureka lemon and other citrus stock with the peach strain, but so far these have been unsuccessful. In March, 1915, under ordinary nursery conditions, successful inoculations were made of the peach strain into apricot and almond, and from the almond strain of the organism into almond and apricot.

During the spring of 1914 a form of Pythiacistis was isolated from a gumming almond tree. This was found to differ from the prevailing strain in its

greater rapidity of growth, simplified branching of the mycelium, ready production of oospores, and failure to infect the pear after inoculation, although small cankers were obtained on the almond.

Factors involved in the growth and the pycnidium formation of Plenodomus fuscomaculans, G. H. Coons (*U. S. Dept. Agr., Jour. Agr. Research, 5 (1916), No. 16, pp. 713–769*).—In a paper contributed from the Michigan Experiment Station, the author gives results of experiments performed with *P. fuscomaculans*, a fungus pathogenic to apple. The specific investigation undertaken was to determine the effect of various controlled environmental factors upon the growth and reproduction of the fungus.

The organism was found to have a wider range of conditions suitable to growth than to reproduction. The base level of conditions necessary for growth was found in conductivity water at low temperatures. Reproduction requires more favorable conditions. As a result of these investigations the author believes a basis for practical recommendations as to culture of other organisms has been found, as well as evidence of the feasibility of developing a standard synthetic solution which would make possible a standardization of environments for diagnostic purposes. The author proposes a theory to explain the mechanism of the opposed action of growth and reproduction, in which it is considered that competition for oxygen is the fundamental reason for absence of fructification under conditions which allow abundant growth.

Preliminary note on leaf invasions by Bacillus amylovorus, F. D. Heald (*Washington Sta. Bul. 125 (1915), pp. 3–7, pls. 2*).—The results from preliminary studies in the field and laboratory on leaf invasions by *B. amylovorus* are given which show that this form of attack is rather common. The leaf invasion was first noticed on Bartlett pears at North Yakima, Wash., but soon after similar attacks were found on Wagener, Jonathan, and Rome Beauty apple trees. Later collections were made from both pear and apple trees throughout Washington. Pure cultures were isolated from leaf lesions and used in inoculation experiments, and in about eight days seedling trees exhibited typical forms of fire blight.

Notes on the fire blight disease, V. B. Stewart (*Phytopathology, 5 (1915), No. 6, pp. 327–334*).—Notes are given on the influence of commercial fertilizers in developing fire blight, varieties of the pear resistant to the disease, and fire blight as favored by hail injury.

In the experiments on the use of fertilizers, nursery ground was prepared and planted in 1911, all seedlings of suitable growth being budded in August to Bartlett pears. In the following year the nursery plats were cultivated four times, and in 1913 and in 1914 fertilizers were again applied and the plats cultivated four times. In July, 1914, five trees in each plat were inoculated with a 2-day-old bouillon culture of *Bacillus amylovorus*, and many infections were apparent within a period of five days. No differences as to the resistance of the trees could be noticed which could be attributed to the fertilizers used. Nitrogen did not materially affect the fire blight by increasing the growth of the trees, nor did phosphates and potash harden the tissues and make them more resistant.

In discussing varieties of pear resistant to blight, the author calls attention to the varieties Douglass and Sand Pear, which, he thinks, afford material suitable for developing a pear that might have considerable resistance. He does not consider entire immunity as very probable.

The unusual prevalence of fire blight in New York in the summer of 1914 is considered as associated with a severe hailstorm, the bacteria being carried to the wounds by insects which visited the trees to feed on exuding sap.

Insect control important in checking fire blight, A. C. BURRILL (*Phytopathology, 5 (1915), No. 6, pp. 343–347*).—As a result of observations and experiments, the author claims that the control of aphids and leaf hoppers, which are carriers of blight, would prove cheaper than the present method of pruning, which is not only expensive but only partially effective. It is specifically stated, however, that this does not apply to the elimination of hold-over cankers, a subject which still needs investigation.

Fire blight on cherries, J. W. HOTSON (*Phytopathology, 5 (1915), No. 6, pp. 312–316, pl. 1*).—The author reports serious damage done by fire blight (*Bacillus amylovorus*) in the Yakima Valley in 1914 and 1915 on apples and pears, as well as on quince, prune, and crab. During the spring and early summer of 1915, it is said that there was a noticeable increase in the infected pears and apples on trees showing little twig or body infestion. About the middle of June, when the cherries were beginning to ripen, a peculiar condition of the fruit on Royal Ann cherry trees was observed, in which about one-third of the fruit on a large tree was infected.

The cherry disease first appears as small depressions on the surface of the fruit. These gradually spread over the entire surface, giving the cherry a shrunken, wilted appearance. In some instances, exudations were noticed on the fruit, and examination showed the exudate contained abundant bacteria which cultures and inoculation experiments proved to be identical with *B. amylovorous* of the pear and apple.

While on the cherry bacteria, so far as reported, occur only on the fruit, the author considers it possible that under favorable conditions the organism may acquire increased pathogenicity and attack this host as it does the pear and apple.

A contribution to our knowledge of silver-leaf disease, J. SMOLÁK (*Ann. Appl. Biol., 2 (1915), No. 2–3, pp. 138–157, figs. 20*).—This is mainly a cytological study describing the departures from the normal cell conditions which were observed in silvered leaves of *Prunus domestica*. The author states that the facts as described show clearly that the alterations displayed by such leaves are not confined to the development of air spaces and the separation of cells, but are far more profound than was at first supposed.

A review of comparisons of healthy with abnormal tissue led to the conclusion that the latter behaves as if parasitized. On structural grounds, it apparently belongs to the category of gall-tissue, taking the term gall in its larger sense.

It is considered possible that certain bacteria occasionally found in plum leaves showing the disease may be related thereto in some way, and are hence a proper subject for further study in this connection.

A bibliography is appended.

On diseases of plum trees caused by some species of Cytospora, W. N. C. BELGRAVE (*Ann. Appl. Biol., 2 (1915), No. 2–3, pp. 183–194, figs. 10*).—The author has described a disease of plum trees as probably due to one or more species of Cytospora, the fungus isolated in most cases being closely related to or identical with *C. leucostoma*.

Complete germination of the spores occurred only in the presence of organic nitrogen. Pycnidia and spores resembling those occurring naturally were obtained in artificial culture, but attempts to induce formation of perithecia were unsuccessful.

Mildew on black currants, V. B. STEWART (*Phytopathology, 5 (1915), No. 6, p. 349*).—The author reports a block of black currant nursery stock which was noticed in July, 1915, as badly affected with mildew (*Sphærotheca mors-uvæ*). In the nursery, all the varieties of black currant and several adjoining rows of

red currants were infected, but gooseberries seemed almost entirely free from the trouble. The only explanation offered for the freedom of the gooseberries which is considered tenable is that of biological specialization.

Note on American gooseberry mildew, M. A. BAILEY (*Ann. Appl. Biol., 2 (1915), No. 2–3, pp. 162–165*).—An instance is given in which gooseberry seedlings showing heavy infection during 1912 were, after removal to another area where they were left unpruned and where they were apparently favored by the direction of the wind and the presence of a low hedge, almost entirely free from the disease in 1913 and 1914.

The South African mulberry blight (Bacterium mori), ETHEL M. DOIDGE (*Ann. Appl. Biol., 2 (1915), No. 2–3, pp. 113–124, pls. 6*).—A report is given on a study since 1908 of a twig and leaf blight of black mulberry, which is rather widespread in certain districts of South Africa. The organism has been isolated and numerous infections have been obtained from pure cultures.

The morphological and cultural characters of the organism corresponded closely with those of *B. mori* causing blight of French and American mulberry. The only important difference was that the organism causing the South African blight has from one to four polar flagella as compared with one or two shown by the American form.

Spraying with Bordeaux mixture proved useless as a means of control.

A brief bibliography is appended.

Citrus canker in the Gulf Coast country, with notes on the extent of citrus culture in the localities visited, E. W. BERGER (*Proc. Fla. State Hort. Soc., 27 (1914), pp. 120–127; abs. in Mycol. Centbl., 5 (1915), No. 6, pp. 287, 288*).—An account is given of a search for the origin of citrus canker after its discovery in two widely separated localities in Florida. The disease is claimed to have been found in Alabama, Mississippi, Louisiana, and Texas, but not at Matamoras, Mexico. The original infection is thought to have come on specimens from Japan, being probably mistaken for scab (*Cladosporium citri*).

A list is given of varieties of citrus plants attacked, in the order of observed severity.

Citrus mildew, T. PETCH (*Phytopathology, 5 (1915), No. 6, pp. 350–352*).—In a publication by Carter (E. S. R., 34, p. 447), attention was called to a mildew of tangerine which, the author believed, had not been previously reported. In the present paper, attention is called to the fact that mildew of citrus trees is very common in Ceylon and also in India. It is considered one of the worst diseases of citrus in Ceylon, where it occurs on varieties of sweet orange and mandarin and is especially destructive on pomelo.

Black neck or wilt disease of asters, W. ROBINSON (*Ann. Appl. Biol., 2 (1915), No. 2–3, pp. 125–137, pls. 2*).—Reporting results of studies since 1914 on the black neck or blackleg disease which is prevalent in market gardens around Manchester, England, the author states that the tissues of the plants, which may become diseased at any stage of growth, always contain the mycelium of a species of Phytophthora, which, on isolation and reinoculation, reproduces the disease. Tests with a Fusarium also isolated gave negative results.

It is stated that while some of the characters of *P. omnivora* are shown, a proliferation of the sporangium as here observed seems to be peculiar to this species. No sexual structures have yet been observed.

A serious disease in forest nurseries caused by Peridermium filamentosum, J. R. WEIR and E. E. HUBERT (*U. S. Dept. Agr., Jour. Agr. Research, 5 (1916), No. 17, pp. 781–785*).—The authors report *P. filamentosum* as causing a serious disease of yellow pine seedlings at the Savenac nursery at Haugan, Mont. The fact that the same species of Peridermium attacks both the lodgepole pine and

the yellow pine increases the difficulty of control. It is stated that the proximity and abundance of the alternate host of *P. filamentosum*, *Castilleja miniata*, and its prolific development on the lodgepole pine in the vicinity of the seedling beds tend to make this a dangerous disease in forest nurseries.

The receptivity of oak for Oïdium, E. PANTANELLI (*Bul. Orto Bot. R. Univ. Napoli, 4 (1914), pp. 309–348, pls. 3, figs. 8*).—Giving the results of studies on the relations of susceptibility, as regards attack by Oïdium, to foliar structure, turgescence, chemical character, etc., the author states that the fungus shows preference, in case of *Quercus pedunculata* and *Q. pubescens*, for portions which are in a growing condition when exposed to infection.

The principal structural difference between foliage which is resistant (none is immune) and that which is receptive is said to be in the inferior development of the mesophyll in the latter, and in its general immaturity. Epidermal structure and cuticular thickness show no relation to susceptibility.

The average concentration of the cell sap is greater in the resistant than in the receptive leaves, but the elastic tension of the cell walls is greater in case of the latter whether or not they are attacked by Oïdium.

The distribution of plastic carbohydrates shows in receptive cells a low degree of activity, so that development is checked and remains comparatively backward in these. The receptive leaves contain less organic nitrogenous materials as compared with inorganic constituents. The conditions of receptivity appear to be static with an excess of insoluble over soluble nitrogen.

The content of mineral substances in the leaf is not related to its receptivity except as it is an indication of an immature condition of the leaves. The receptive leaves are richer in soluble phosphorus than those relatively resistant.

A bibliography is appended.

Control of pine rust, SCHULTZ (*Ztschr. Forst u. Jagdw., 47 (1915), No. 1, pp. 8–29, figs. 5*).—The author states that he has confirmed the conclusion of Haack (E. S. R., 31, p. 153) to the effect that infection by pine rust occurs on the young needle-bearing shoots. It is said also that the fungus may kill young shoot tips before reaching its fruiting stage.

Removal of affected trees steadily reduced the infection.

ECONOMIC ZOOLOGY—ENTOMOLOGY.

Digest of the game, fish, and forestry laws, edited by J. KALBFUS (*Harrisburg, Pa.: State, 1915, pp. 342*).—This pamphlet, published biennially (E. S. R., 32, p. 150), contains the text with indexes of the laws of Pennsylvania on game, fish, and forestry, and leading discussions relating thereto.

The food of birds, LAURA FLORENCE (*Trans. Highland and Agr. Soc. Scot., 5. ser., 27 (1915), pp. 1–53*).—In this report of work carried on in continuation of that previously noted (E. S. R., 31, p. 547) the results of examinations of the crop contents of 891 birds, representing a large number of species, are reported upon.

Bird houses and nesting boxes, E. H. FORBUSH (*Mass. Bd. Agr. Circ. 47 (1915), pp. 24, pls. 8, figs. 33*).—This circular describes and gives plans and illustrations of bird houses and nesting boxes.

Attraction and protection of birds, G. WOLDA (*Vogelcultuur. The Hague: Dept. Landb., Nijv. en Handel, 1914, pp. 26, pls. 2, figs. 16*).—Methods of attracting birds are described and illustrations and plans of bird houses and nests are given.

How to attract wild birds about the home, N. M. LADD (*Greenwich, Conn.: The Greenwich Bird Protective Society, Inc., 1915, pp. 68, pl. 1, figs. 46*).—A

popular account, to which is appended the first annual report of the Greenwich Bird Protective Society.

Bibliography of Canadian zoology, 1913, E. M. Walker (*Proc. and Trans. Roy. Soc. Canada, 3. ser., 8* (*1915*), *Sect. IV, pp. 271–285*).—This annotated list covers the literature exclusive of entomology.

[Animal pests, etc., in Colorado] (*Off. State Ent. Colo., 1914, Circs. 10, pp. 8, figs. 3; 11, pp. 8; 12, pp. 34; 13, pp. 9, figs. 4; 14, pp. 19, fig. 1; 1915, Circs. 15, pp. 44; 16, pp. 8*).—In continuation of this series of circulars (E. S. R., 30, p. 249) No. 10, by W. L. Burnett, deals with pocket gophers; No. 11, by W. Foster, with Colorado apiary inspection; Nos. 12 and 15, by C. P. Gillette and G. M. List, consist of the fifth and sixth annual reports of the state entomologist; No. 13, by C. R. Jones, deals with grasshoppers; No. 14, by W. L. Burnett, with the striped ground squirrels of Colorado; and No. 16 contains Colorado's amended pest law. The annual reports include reports upon orchard and nursery stock inspection, rodent investigations by W. L. Burnett, and apiary inspection work by W. Foster, during the years 1913 and 1914, respectively, and other data.

Report on economic zoology for the year ending September 30, 1913, F. V. Theobald (*Jour. Southeast. Agr. Col. Wye, No. 22* (*1913*), *pp. 193–350, pls. 17, figs. 69*).—This annual report (E. S. R., 30, p. 53) deals with the more important pests of the year, taken up under the headings of animals injurious to fruit trees and bushes, hops, cereals, root crops, grass land, and fodder, vegetables, ornamental plants, and forest trees, those causing annoyance to man, and those injurious to furniture, stored food, etc.

Insects of economic importance.—Outlines of lectures in economic entomology, G. W. Herrick (*Ithaca, N. Y.: Carpenter & Co., 1915, pp. 138*).—This work presents a brief summary of the life history and habits, where known, and methods of control of the principal insect pests of fruits, vegetables, cereals, farm animals, shade trees, and the household. A brief discussion is also given of insecticides, together with formulas and directions for making and applying them.

New insect life histories, I, R. A. Muttkowski (*Bul. Wis. Nat. Hist. Soc., n. ser., 13* (*1915*), *No. 2, pp. 109–122, figs. 5*).—This account relates to the life histories of *Psychoda cinerea* and *Diamesa mendotæ* n. sp.

The rearing of larvæ, with special reference to the British Lepidoptera, C. Rippon (*Entomologist, 48* (*1915*), *Nos. 624, pp. 112–116; 625, pp. 147–150; 626, pp. 164–169; 627, pp. 186–190*).—Methods of rearing larvæ are described.

Proceedings of the Entomological Society of British Columbia, 1915 (*Proc. Ent. Soc. Brit. Columbia, n. ser., No. 6* (*1915*), *pp. 99–134, fig. 1*).—The papers here presented are as follows: Nomenclature and Classification (Presidential Address), by G. O. Day (pp. 99–110); Notes on *Lithocolletis gaultheriella* (Leaf Miner in *Gaultheria shallon*), by R. N. Chrystal (pp. 111–114); Further Notes on the Species of the Genus Hydriomena Occurring on Vancouver Island, B. C. (pp. 114, 115), and Notes on Changes in Geometrid Nomenclature with Records of Species New to the List of Geometridæ Found in British Columbia (pp. 116–122), both by E. H. Blackmore; and Insects Recorded in the Atlin District (Northern British Columbia) During the Summer of 1914, by E. M. Anderson (pp. 122–132).

[Insect pests in St. Vincent], F. Watts (*Imp. Dept. Agr. West Indies, Rpt. Agr. Dept. St. Vincent, 1913–14, pp. 11, 12*).—Brief reference is made to the occurrence of insect pests in St. Vincent during the year under report.

[Insect pests in St. Lucia], F. Watts (*Imp. Dept. Agr. West Indies, Rpt. Agr. Dept. St. Lucia, 1913–14, pp. 7, 8*).—Brief reference is made to the more

important insect pests occurring in St. Lucia during the year ended March 31, 1914.

Insect pests in 1914, R. S. MacDougall (*Trans. Highland and Agr. Soc. Scot., 5. ser., 27 (1915), pp. 211–237, figs. 20*).—This is the annual report of the occurrence of the more important pests of the year (E. S. R., 31, p. 648).

Report of the entomological division of the Salgir Experimental Station of Horticulture, 1913–14, S. Mokrzhetskiĭ and A. Bragina (*Otchet Ent. Kab. Salgirsk. Opytn. Plod. Sta., 1913–14, pp. 9*).—This division was established with a view to investigating fruit insects and their control.

During 1913, 19.5 per cent of the codling moth caterpillars were parasitized by tachinids. *Trichogramma fasciatum* (*embryophagus*) and *T. semblidis* have been found to parasitize the eggs of *Barathra* (*Mamestra*) *brassicæ, Plusia* sp., *Pieris rapæ,* etc., in the Crimea. Twenty-five generations of *T. fasciatum* were reared without any males having been observed. At the optimum temperature of 32° C. (89.6° F.) the life cycle from the deposition of the egg to the appearance of the adult took place in less than eight days.

The gipsy moth, which appeared in great numbers in the Crimea in 1913, was followed by a parasitism by tachinids of about 25 per cent, and flacherie destroyed 10 per cent. A large part of those which succeeded in pupating were also parasitized by tachinids.

Several other insects are also mentioned.

[Report of the entomologist], W. W. Froggatt (*Rpt. Dept. Agr. N. S. Wales, 1914, pp. 33–36*).—A brief report of the occurrence of and work with insects of the year. *Thrips tabaci,* which appeared in large numbers throughout the east and middle areas of the State, is said to have been the most important pest of the year of horticultural crops.

Report of the entomologist, A. Rutherford (*Rpt. Dept. Agr. Ceylon, 1912–13, pp. 9–12*).—This report upon the occurrence of and work with insects deals with the subject under the headings of pests of tea, rubber, cacao, coconut, rice, cotton, citrus, etc.

Report of the entomologist, A. Rutherford (*Rpt. Dept. Agr. Ceylon, 1914, pp. 12–17*).—This annual report deals largely with the occurrence of the more important insects of the year in Ceylon.

Some minor pests of tea recently reported, A. Rutherford (*Trop. Agr. [Ceylon], 43 (1914), No. 6, pp. 440–442*).—Several minor pests of tea here mentioned are *Euproctis* sp., a small weevil (*Astycus immunis*), a capsid (*Callicratides rama*), two coreids (*Riptortus pedestris* and *R. fuscus*), a species of Heliothrips, the soft scale, the hemispherical scale, *Ripersia theæ* n. sp., etc.

Theory of toxicity, C. W. Woodworth (*Jour. Econ. Ent., 8 (1915), No. 6, pp. 509–512, fig. 1*).—"The theory of toxicity which this study enables us to put forward is (1) that there are three separate effects produced by a poison, depending on its concentration; (2) that there is a line of deviation beyond which their characteristics become most evident; (3) that acute poisoning reaches a crisis, after which the rate of death rapidly declines; and (4) that these phenomena exhibit a series of very definite mathematical relationships."

A new mixture for controlling wood-boring insects, sodium arsenate-kerosene emulsion, F. C. Craighead (*Jour. Econ. Ent., 8 (1915), No. 6, p. 513*).—The author finds that kerosene emulsion to which is added a 5 to 10 per cent solution of sodium arsenate will penetrate the wood and galleries and kill borers. In living and seasoned wood the frass in larval mines is often penetrated to a distance of from 10 to 12 in. Tests made on Goes mines in living trees showed that by painting the holes where the boring dust is exuded this solution quickly ascends along the sides of the burrow and through the frass, killing the larvæ in a few days.

On the employment of heat in the control of insects, L. SEMICHON (*Compt. Rend. Acad. Sci. [Paris], 160 (1915), Nó. 17, pp. 569–671*).—The author finds that a spray of water at a temperature of from 55 to 65° C. (131 to 149° F.) causes the death of caterpillars of the vine pyralid (*Tortrix pilleriana*) and the cochylis and eudemis moths at the time they emerge from the egg and are not protected, and does not injure the foliage. It should be applied in April and May at the time the caterpillars crawl to the extremity of the shoots and before they are inclosed in webs and protected by leaves. Under similar conditions it causes the death of the eggs of the cochylis and eudemis moths. This method of treatment is thought to be more effective than the use of arsenical or nicotin insecticides, since it can be used against the second and third generations after the berries are well developed.

The use of a copper mixture heated to from 55 to 65° C. makes possible the control of both insects and fungi.

Fumigating the household, G. G. BECKER (*Arkansas Sta. Circ. 28 (1915), pp. 8, figs. 3*).—Directions are given for the fumigation of the household with hydrocyanic acid gas.

Some studies on the snowy tree cricket with reference to an apple bark disease, P. J. PARROTT, W. O. GLOYER, and B. B. FULTON (*Jour. Econ. Ent., 8 (1915), No. 6, pp. 535–541*).—It is stated that in cooperative work cultural and microscopical studies have revealed the fact that *Leptosphæria coniothyrium* (*Coniothyrium fuckelii*) is the causal agent of a canker-like bark disease of the apple which occurs in New York State. The present paper reports upon attempts made to determine the relation of tree crickets to the transmission of this disease.

Feeding experiments indicate that spores may pass through the alimentary tract of the crickets without loss of their vitality. "When crickets were starved two days before feeding, spores of various fungi passed through the intestinal tract in a period of 6.5 hours. When tree crickets were allowed to feed normally before the tests, spores of various fungi, including the New York apple canker (*Sphæropsis malorum*) and blister canker (*Nummularia discreta*), were found in the excreta four days after diseased wood was removed from their diet. Cultural tests of spores in the excreta showed that spores of the New York apple canker and the mica inky cap (*Coprinus micaceus*) passed unharmed through the intestinal tracts of the crickets. Spores of the blister canker showed poor germinating qualities. . . . In twelve attempts to establish the New York apple canker, the Coniothyrium canker, and brown rot (*Sclerotinia fructigena*) in peaches and apples, all proved failures except in one experiment where there were three slight infections by the Coniothyrium canker."

Gryllotalpa gryllotalpa, the European mole cricket in New Jersey, H. B. WEISS (*Jour. Econ. Ent., 8 (1915), No. 5, pp. 500, 501*).—The author records an infestation of the European mole cricket (*G. gryllotalpa*), extending over several acres planted to herbaceous and ornamental stock in a nursery at Rutherford, N. J., which appears to be of several years' duration.

Some developments in grasshopper control, F. M. WEBSTER (*Jour. Econ. Ent., 8 (1915), No. 6, pp. 527–535, fig. 1*).—A discussion of recent work.

The spring grain aphis or "green bug" in the Southwest and the possibilities of an outbreak in 1916, F. M. WEBSTER (*U. S. Dept. Agr., Office Sec. Circ. 55 (1916), pp. 3, figs. 3*).—Directions are given for combating the spring grain aphis or "green bug" (*Toxoptera graminum*).

On the mouth parts and mechanism of suction in Schizoneura lanigera, J. DAVIDSON (*Jour. Linn. Soc. [London], Zool., 32 (1914), No. 218, pp. 307–330, pls. 2, figs. 2*).—Following a brief discussion of the technique and methods and

nomenclature, including a review of the literature, the author deals with the structure and mechanism of the mouth parts. A bibliography of 23 titles is appended.

The potato moth: An experimental investigation into the methods of controlling its ravages in stored tubers, F. Stoward (*Abs. in Jour. Nat. Hist. and Sci. Soc. West. Aust., 5 (1914), pp. 15–19*).—In a report of experiments in which formalin, mercuric chlorid, copper sulphate, sodium carbonate, sulphuric acid, arsenate of lead, phenol, carbon bisulphid, air-slaked lime, lime-sulphur, etc., were used, carbon bisulphid alone gave satisfactory results in controlling the ravages of *Phthorimea operculella* in stored potatoes.

"The destruction of the larvæ, either in the substance of the tuber or external to it, is accomplished by fumigating larva-infested tubers with this compound at the rate of 1 or 2 lbs. per 1,000 cu. ft. of space for a period of 16 hours. In the annihilation of the egg and pupa, however, using either of these amounts of carbon bisulphid per unit of space, the fumigation period must not be less than 48 hours, and to insure complete destruction of these life forms the application of a second fumigation four to six days after the first is necessary. . . .

"In an experimental study of the influence of carbon bisulphid fumigation on the vitality of the tuber buds, the culinary and storage qualities of the tuber and the results of planting fumigated 'seed' tubers, the author reports that sound, infested, and uninfested tubers may be intermittently fumigated with 1 to 2 lbs. of carbon bisulphid per 1,000 cu. ft. of space for a period of 48 hours two, three, or four times without causing injury to the tuber buds or impairing the storage and edible qualities of the tuber."

The tent caterpillar, H. T. Fernald (*Mass. Bd. Agr. Circ. 46 (1915), pp. 5, figs. 3*).—A brief popular account.

Observations on the biology of the grapevine moths and means for their control, P. Voglino (*Bol. Min. Agr., Indus. e Com. [Rome], Ser. B, 14 (1915), II, No. 1–2, pp. 21–29*).—This account relates to work with *Cochylis ambiguella* and *Polychrosis botrana* in Italy in 1914.

The prevention of egg laying on turnips by the diamond-back moth, R. A. H. Gray (*Jour. Bd. Agr. [London], 22 (1915), No. 3, pp. 222–226*).—Experiments conducted have led to the recommendation that when this moth appears 2.5 cwt. of ground stone lime per acre be carefully broadcasted on the young turnips, preferably on a dewy morning when there is no wind.

Typical flies: A photographic atlas of Diptera, including Aphaniptera, E. K. Pearce (*Cambridge: University Press, 1915, pp. XII+47, figs. 155*).—This consists largely of reproductions of photographs of representatives of the various families of Diptera.

The Chironomidæ, or midges, of Illinois, with particular reference to the species occurring in the Illinois River, J. R. Malloch (*Bul. Ill. State Lab. Nat. Hist., 10 (1915), Art. 6, pp. 273–543, pls. 24*).—This work, which is largely systematic, presents tables for the separation and description of the species occurring in Illinois.

A synonymic catalogue of the dipterous family Phoridæ, C. T. Brues (*Bul. Wis. Nat. Hist. Soc., n. ser., 12 (1914), No. 3–4, pp. 85–152*).—This catalogue lists the Phoridæ of the world, including the few fossil forms which have been given names. Forty-six genera and 472 species are thus catalogued.

Notes on the preoviposition period of the house fly, Musca domestica, R. H. Hutchison (*U. S. Dept. Agr. Bul. 345 (1916), pp. 13, fig. 1*).—"From the experiments reported in this paper it is seen that the shortest record for the preoviposition period was one of about 2.5 days and the longest one of 23 days, with most of the records falling on the fourth, fifth, sixth, ninth, twelfth, and

fourteenth days after emergence. It is shown that the temperature has a very decided influence on the length of the period. Other factors influencing this period are humidity, the kind and quality of the food of the adults, and the kind and quality of the larval food, with its resulting effect on the size and physiological condition of the adults. In the experiments with isolated pairs of flies very few results were obtained, which suggests that the association of a small number of females in the process of egg laying is the normal habit and that isolation has an inhibiting effect.

"Copulations were observed as early as the first day after emergence and as late as the forty-seventh day. No copulations have been noted when the air temperature has been below 55° F. The maximum record for longevity was 70 days, and the minimum was one day or less. The average of the records of some 3,000 flies was slightly over 19 days."

Banana as a host fruit of the Mediterranean fruit fly, E. A. Back and C. E. Pemberton (*U. S. Dept. Agr., Jour. Agr. Research, 5 (1916), No. 17, pp. 793–803, pls. 4*).—"Since the Mediterranean fruit fly (*Ceratitis capitata*) has not been found infesting the Chinese banana (*Musa cavendishii*) or the Bluefield banana (*Musa* sp.) during the three years that the Federal Government has had charge of the inspection of export bananas in the Hawaiian Islands, it is evident that some reason exists for this practical immunity. This is the more apparent since adult flies of both sexes have been found present in all parts of banana plantations, and surrounding fruits known to be hosts have been heavily infested.

"This immunity is shown to be due to the fact that neither the egg nor the newly hatched larva of the fruit fly can survive in the tannin-laden peel of green though mature fruit. In fact, the copious and sudden flow of sap from egg punctures made by fruit flies in unripe bananas renders the successful deposition of eggs in such fruits difficult and rare.

"The fact that not 1 of 1,044 fruits of the Chinese banana ripening singly and prematurely among bunches growing in the field, and upon which, as in the case of other host fruits, one might expect gravid females to concentrate their attention for the purpose of oviposition, has been found to be infested leads to the conclusion that even ripe bananas are not desired as host fruits by adult flies under Hawaiian conditions. On the other hand, the rearing of flies from the ripe and yellow fruits of the thin-skinned Popoulu variety, as well as from ripe fruits of other varieties under forced and unnatural conditions, leads to the equally acknowledged fact that ripe bananas in the field may serve as hosts and should therefore be properly guarded against in all quarantine work.

"From the facts stated the writers believe that bunches of any variety of banana now growing in the Hawaiian Islands, when properly inspected for the removal of prematurely ripe, cracked, or partially decayed fruits, offer no danger as carriers of the Mediterranean fruit fly, provided they are wrapped and shipped in accordance with the demands of the trade and the federal regulations."

New neotropical muscoid flies, C. H. T. Townsend (*Proc. U. S. Nat. Museum, 49 (1915), pp. 405–440*).—The present paper is in continuation of the publication of the results of identifying Peruvian collections previously noted (E. S. R., 34, p. 65), with the inclusion of a few other neotropical forms. Thirty-nine genera and type species are described as new.

Leptinotarsa decemlineata, W. O. Ellis (*Jour. Econ. Ent., 8 (1915), No. 6, pp. 520, 521*).—The author records the oviposition of 1,686 eggs by a female between July 8 and September 1.

The poisonous effects of the rose chafer upon chickens, G. H. Lamson, Jr. (*Jour. Econ. Ent., 8 (1915), No. 6, pp. 547, 548*).—Serious losses which have

occurred in Connecticut from year to year during June and July as a result of chickens feeding upon rose chafers led to the investigation here reported.

It is stated that a number of cases have been reported to the author, in some of which the loss of several hundred chickens resulted.

An extract made from crushed rose chafers and distilled water, filtered, and fed to chickens in varying doses with a medicine dropper resulted in a large number of deaths. Small chickens died in a few hours after feeding, whereas older chickens when fed a small quantity of the extract lived but showed signs of poisoning, and large doses caused their deaths. The results show that from 15 to 20 rose chafers are sufficient to cause the death of chickens a week old, and that from 25 to 45 rose chafers are usually necessary to kill a 3-weeks-old chicken. Some 9-weeks-old chickens were killed by eating rose chafers, but only one 10-weeks-old chicken was killed in the experiments.

The author concludes that rose chafers contain a neurotoxin that has a direct effect upon the heart action of both chickens and rabbits and are excessively dangerous as a food for chickens.

Some notes on the western twelve-spotted and the western striped cucumber beetles, R. A. SELL (*Jour. Econ. Ent., 8 (1915), No. 6, pp. 515–520*).—Notes on the biology of *Diabrotica soror* and *D. trivittata*.

Investigations on borers and borers' parasites, M. ISHIDA (*Meded. Proefstat. Java-Suikerindus., 5 (1915), No. 12, pp. 334–349, figs. 3*).—The investigations here reported were carried out by the Formosa government entomologist at the experiment station in Pasuruan, Java.

Egg masses of *Diatræa striatalis* to the number of 5,068 were collected with a view to determining the percentage of parasitism. Of these 10.9 per cent were parasitized by Trichogramma (*Trichogrammatoidea nana* and *Trichogramma pseudonana*), 31.9 per cent by Phanurus, and 7.4 per cent by both Trichogramma and Phanurus. From 146 egg masses containing 2,352 eggs, 1,813 specimens of *P. beneficiens* were reared, of which but 4.35 per cent were males. A total of 37.6 per cent were free from parasites. The number of eggs of the gray borer (*Grapholitha schistaceana*) found in a cane field in Pasuruan is tabulated.

Experiments in the control of the poplar and willow borer (Cryptorhynchus lapathi), R. MATHESON (*Jour. Econ. Ent., 8 (1915), No. 6, pp. 522–525*).—The results obtained in the destruction of the eggs and young larvæ by applications of a number of insecticides, including scalecide, kerosene emulsion, carbolineum, and carbolineum emulsion, applied to trunks from the ground up to the young growth, are reported upon. It was found that carbolineum applied pure and its emulsion gave almost absolute control and seem to be very simple and effective means of control under nursery conditions.

Another nodule destroying beetle, W. R. MCCONNELL (*Jour. Econ. Ent., 8 (1915), No. 6, p. 551*).—The author reports having found the nodules on the roots of *Sesbania macrocarpa* growing at Greenwood, Miss., to be injured by larvæ of the otiorhynchid *Eudiagogus rosenschoeldi*.

Studies on the biology of the Arizona wild cotton weevil, B. R. COAD (*U. S. Dept. Agr. Bul. 344 (1916), pp. 23, pls. 2, fig. 1*).—In this report of boll weevil work carried on in continuation of that previously noted (E. S. R., 33, pp. 257, 563) the author deals with the distribution and habitat of the Thurberia plant and weevil, the seasonal activity of plant and weevil in nature, the emergence of weevils, the relative attraction of cotton and Thurberia for weevils, natural enemies of the weevil, and life history studies, including fecundity, developmental period, and tests of caged weevils on growing plants.

Bees and their diseases (*Bd. Agr. and Fisheries [London], Misc. Pub. 4 (1914), pp. 82–101, figs. 2*).—A reprint of leaflets on the subject arranged in convenient form for the use of the beekeeper.

Beekeeping, C. C. Ghosh (*Agr. Research Inst. Pusa Bul. 46 (1915), pp. IV+87, pls. 8, figs. 67*).—A manual intended for use of beekeepers.

Foul brood regulations effective on and after March 1, 1916, F. B. Paddock (*Texas Sta. Circ. 11, n. ser. (1916), pp. 10*).—The regulations adopted by the state entomologist in accordance with the requirements of the foul brood law (E. S. R., 34, p. 454), are presented.

The ichneumons of Great Britain, C. Morley (*London: H. & W. Brown, 1914, vol. 5, pp. X+400, pls. 4, figs. 37*).—This fifth volume (E. S. R., 27, p. 359), which deals with the Ophioninæ, includes a classified list of the tribe, a list of the enumerated hosts, and an index to the genera and species.

A catalogue of the British Ichneumonidæ, including the Ichneumoninæ, Cryptinæ, Pimplinæ, Tryphoninæ, and Ophioninæ (pp. 369–395), and notes on alterations in the catalogue (pp. 396–400) are appended.

Catalogue of the British Ichneumonidæ, C. Morley (*London: H. & W. Brown, 1915, pp. 27*).—This reprint of the catalogue above mentioned is printed on one side of paper for labelling and without notes.

The ichneumonid genus Pimpla, O. Schmiedeknecht (*Ztschr. Angew. Ent., 1 (1914), No. 3, pp. 396–478, figs. 12*).—A synopsis of the European species of this genus of parasites, together with a host list.

Notes on Ichneumon lætus, H. H. Knight (*Jour. Econ. Ent., 8 (1915), No. 6, pp. 514, 515, pl. 1*).—The author's breeding experiments have shown that the army worm parasites known as *I. canadensis* and *I. funestus* are females of *I. lætus*.

A new species of Gonatocerus (Mymaridæ) parasitic on the eggs of a new species of Idiocerus (Bythoscopidæ) feeding on poplar, M. D. Leonard and C. R. Crosby (*Jour. Econ. Ent., 8 (1915), No. 6, pp. 541–547, figs. 12*).—Technical descriptions are given of *Idiocerus gemmisimulans* n. sp. and its several instars, the eggs of which are parasitized by *Gonatocerus ovicenatus* n. sp.

The cherry and hawthorn sawfly leaf miner, P. J. Parrott and B. B. Fulton (*New York State Sta. Bul. 411 (1915), pp. 551–580, pls. 6, figs. 9*).—Substantially noted from another source (E. S. R., 34, p. 456).

A new cherry and hawthorn pest, F. H. Hall (*New York State Sta. Bul. 411, popular ed. (1915), pp. 4, pls. 2*).—A popular edition of the above.

The pavement ant (Tetramorium cespitum) as a pest of cold-frame and greenhouse crops, L. B. Smith (*Virginia Truck Sta. Bul. 16 (1915), pp. 353–365, figs. 6*).—During the past two years growers in the Norfolk region have been suffering losses from attacks of the pavement ant on several cold-frame and greenhouse crops. This ant is a native of Europe, which was introduced into the United States probably 150 years ago, since which time it has become quite widely distributed throughout the eastern part of the country. While it leads a more or less rural life in its European home, in this country it has become a house pest in cities and towns, but not having until quite recently been reported as injurious to crops.

"The habit of the insect in making its nest under concrete floors, walks, or pavements renders it somewhat difficult to control. Two species occur in this region which might be confused with the pavement ant, the red ant (*Monomorium pharaonis*) and the little black ant (*M. minutum*). These can be distinguished by their smaller size and difference in coloration.

"The pavement ant has been observed to feed on the following vegetables: Kohl-rabi, cauliflower, cabbage, eggplant, Brussels sprouts, pepper, tomato, radish, parsley and lettuce. The attacks occur to the roots, crown, and lower portion of the stem. The injury to the stem and crown resemble that caused by cutworms. Injuries to the roots might often pass unnoticed were it not for

the effect upon the plant. The attacks have been found to be more severe during the spring, autumn, and winter seasons.

"Where the nests are accessible, fumigation with carbon bisulphid has proved the most efficient method of control. If the nest occurs on the surface of the ground, place a saucer containing a few ounces of the liquid fumigant on the ground over the nest and cover the whole with several thicknesses of heavy canvas. Allow the fumigation to continue for at least 12 hours. If the nest is underground, push swabs of absorbent cotton soaked in the fumigant down into the nest, firmly packing the soil over them. In case these methods can not be applied poison baits may be used. So far they have given excellent results. Killing the ants with hot water is also an advantageous method. Fish scrap fertilizer may be found to have some value as a repellent against this insect."

The red spider, F. Zacher (*Gartenflora, 64 (1915), No. 11–12, pp. 171–182, figs. 10*).—An account of the red spiders occurring in Germany, their economic importance, and means of control.

A progress report on Sarcocystis tenella, J. W. Scott (*Wyoming Sta. Rpt. 1915, pp. 114–118*).—The data here presented have been substantially noted from another source (E. S. R., 34, p. 384).

It is stated that sarcosporids are very common among Wyoming sheep, 62 of 77 sheep examined at a local slaughterhouse having been found to be infested. It is pointed out that the results of the experiments reported can not be explained on the theory that the sheep is the definitive host of *S. tenella,* and that if the parasite is an aberrant form the definitive host is probably some insect or other invertebrate.

FOODS—HUMAN NUTRITION.

Food chemistry in 1914, J. Rühle (*Ztschr. Angew. Chem., 28 (1915), Aufsatzteil, Nos. 80, pp. 397–401; 82, pp. 405–408; 84, pp. 416–419; 85, pp. 431, 432*).—A summary and digest of data, with many references to the literature.

International catalogue of scientific literature. Q—Physiology. QR—Serum physiology (*Internat. Cat. Sci. Lit., 11 (1915), pp. VIII+892, 148+30*).—This volume, like the previous editions (E. S. R., 32, p. 565), contains references to the literature of physiology, including among other branches of the subject physiological chemistry, respiration, digestion, absorption, and metabolism. In the second part of the volume references to serum physiology are given.

The history of nutrition, Lichtenfelt (*Die Geschichte der Ernährung. Berlin: Georg Reimer, 1915, pp. 365; abs. in Zentbl. Biochem. u. Biophys., 18 (1915), No. 7–8, pp. 247, 248*).—This book discusses the fundamental principles of the chemistry and physiology of nutrition, both from the historical and practical standpoint. Although some radical theories are exploited, a large amount of serviceable information is here available.

Not by bread alone, H. W. Wiley (*New York: Hearst's International Library Co., 1915, pp. VIII+374, pl. 1*).—In this book the author has brought together and critically discussed in simple language the principles of human nutrition. In addition to the customary definitions and descriptions of proteins, fats, carbohydrates, and mineral substances, and a discussion of the rôle of all these food constituents in maintaining a normal, healthy life, special attention is given to the following general topics: The economy of nutrition; infant feeding and the feeding of children of different ages; the relations of good teeth to nutrition; the influence of the diet on disease and old age; and the practical application of the principles of nutrition.

The nutritive value of boiled milk, Amy L. Daniels, Sylvia Stuessy, and Emma Francis (*Amer. Jour. Diseases Children, 11* (*1916*), *No. 1, pp. 45–54, figs. 8*).—This paper reports a series of experiments in which laboratory animals (rats) which were just past the suckling period were fed milk that had been boiled for 1 minute, 5 minutes, and 45 minutes, respectively. Other rats were fed pasteurized milk (heated to 83° C. by passing over heated drums, and cooled immediately); another group was fed upon milk which had been subjected to a temperature of 114° for 45 minutes in an autoclave; and the group serving as controls were fed upon raw milk. In all the experiments the animals were given all the milk they desired. Curves are given which show the rate of growth of each group of animals.

From the results of these experiments, which are reported in detail, the authors conclude that "the milk heated to the boiling temperature or thereabouts is an inadequate food. Rats fed on boiled milk grew to about half their normal size. Although we have been able to keep these experimental animals for many months on boiled milk, in no case have we got reproduction, nor have any of our animals reached the normal weight for adult rats.

"Milk which is kept at the boiling temperature for 45 minutes is no less efficient as food than milk boiled for much shorter periods—10 minutes or 1 minute. The chemical changes which make heated milk an inadequate food are brought about at the boiling temperature or thereabouts. The value of pasteurized milk as a food, therefore, will depend on the temperature to which it is heated during the pasteurization process. Heating milk to a higher temperature than boiling (114°) makes it even less valuable as a food.

"Although boiled cow's milk is an inadequate food for rats, it is apparently better borne than raw or pasteurized cow's milk, for we have been unable to raise young rats on either exclusively. However, rats fed both raw and pasteurized milk to which small amounts of meat extract were added grew at the normal rate. The explanation of this lies, possibly, in the fact that the meat extract caused an increase in the digestive secretions, thus making the milk more available.

"The advantage of using raw milk for infant feeding is obvious. When babies are unable to digest raw cow's milk, however, or there is danger that the milk may be contaminated, we believe that the pediatrist is justified in using boiled milk. When this is given, the mixture should have a higher protein content than when raw milk is used."

Gastro-intestinal studies.—XI, Studies on the relative digestibility and utilization by the human body of lard and hydrogenated vegetable oil, C. A. Smith, R. J. Miller, and P. B. Hawk (*Jour. Biol. Chem., 23* (*1915*), *No. 2, pp. 505–511*).—Four digestion experiments with normal men are reported by the authors, who studied the relative digestibility of lard (melting point 45° C.) and hydrogenated cotton-seed oil (melting point 36°). The experiments were of eight days' duration, separated by an interval of three days when an ordinary mixed diet was eaten. The basal ration consisted of shredded wheat, meat, biscuits, potato chips, milk (in small quantity with cereal), apple, sugar, jelly, agar-agar, and water.

It was found that the lard was 94.7 per cent and the hydrogenated vegetable oil 93.35 per cent utilized. In the opinion of the authors, this difference may be considered within the limits of accuracy of the experiment, from which it is concluded that the two fats were equally well digested and utilized.

The utilization of bones for food, G. Morpurgo (*Österr. Chem. Ztg., 18* (*1915*), *No. 16, p. 139*).—A description is given of a method for using bones for food. The bones are ground and treated with dilute hydrochloric acid to remove

insoluble lime salts. The insoluble residue is then cooked with dilute sodium bicarbonate to precipitate any remaining calcium salts, and the product, which consists of gelatin and some fat, is suitable for use as soup stock.

The inversion and fermentation of sugar in flour, H. Kühl (*Ztschr. Öffentl. Chem., 21 (1915), No. 10, pp. 149–152; abs. in Chem. Zentbl., 1915, II, No. 2, p. 88*).—Experiments are described concerning the loss often produced in flour and bakery products by fermentation. Bacteria which form invertase, as well as acid formers, were found to be chiefly responsible for the spoiling of bread containing sugar.

The influence of salts on the amylolytic ferments of bread, J. Effront (*Monit. Sci., 5. ser., 6 (1916), I, No. 889, pp. 5–12*).—Digestion experiments in vitro are reported, which indicate, in the author's opinion, that the phosphate content of bread directly influences its digestibility. The bi- and trivalent salts contained in the bread partly neutralizes free hydrochloric acid, and assist the amylolytic ferments to continue their work in the digestion process.

The sugar beet and derived products (pulp, sirup, sugar) as raw materials for bread making, M. P. Neumann (*Ztschr. Ver. Deut. Zuckerindus., No. 711 (1915), II, pp. 215–225*).—Baking tests are reported in which various products derived from the sugar beet were added to rye flour in bread making.

Bread made of rye flour and freshly rasped sugar beets was of unsatisfactory quality. With 5 and 10 per cent of beet flour (consisting of protein, 4.1 per cent; fat, 0.2 per cent; sugar, 60.4 per cent; crude fiber, 4.7 per cent; and nitro-free extract, 22.2 per cent) a very good bread with a sweet taste was obtained. Beet sugar in the form of a sirup (40 per cent sucrose and 40 per cent invert sugar) and beet molasses were also successfully used. Rising and baking were normal, and bread of good properties was obtained. Not more than 5 per cent of these materials, however, is recommended for general use.

The digestibility of war bread, Decker (*München. Med. Wchnschr., 62 (1915), No. 21, pp. 709, 710; abs. in Zentbl. Physiol., 30 (1915), No. 9, p. 396*).—The author discusses the digestibility of war bread, and concludes that careful preparation of the bread and thorough mastication are desirable to prevent the occurrence of digestive disturbances.

Poisonous bread, W. A. Uglow (*Ztschr. Hyg. u. Infektionskrank., 78 (1914), No. 2, pp. 301–320; abs. in Hyg. Rundschau, 25 (1915), No. 18, p. 685*).—A description is given of bread which was fermented by a yeast of the *Fusarium roseum* type. This bread, which has poisonous properties, is characterized by a depreciated nutritive value and a strongly bitter taste. Its consumption by human beings in parts of European Russia has been followed by serious physiological disturbances.

The economical use of potatoes, Bodinus (*Pharm. Ztg., 60 (1915), No. 23, p. 188; abs. in Chem. Zentbl., 1915, II, No. 1, pp. 37, 38*).—The loss of material when potatoes are boiled without their skins was found to be at least 2 per cent. Only 1.25 per cent of starch and 10 per cent of nutritive salts were extracted when salt was added to the boiling liquor, while water containing no salt caused a loss of as much as 33 per cent of mineral matter.

Table sirups other than maple, A. Lemoine (*Lab. Inland Rev. Dept. Canada Bul. 320 (1915), pp. 23*).—This bulletin reports the results of the analysis of 200 samples of sirups other than maple used for table purposes in Canada. They are classified as follows: Cane sugar sirups, 49; essentially glucose sirups, 109; mixtures containing a considerable percentage of cane sugar sirup, 27; and molasses, 15.

Sugar extravagance in baking, F. Stietzel (*Ztschr. Offentl. Chem., 21 (1915), No. 10, pp. 152, 153; abs. in Chem. Zentbl., 1915, II, No. 2, p. 88*).—Baking experiments conducted under conditions customary in bakeries are

reported. These indicate, in the author's opinion, that there is a waste of from 8 to 27.8 per cent of sugar in ordinary baking practice.

Some effects of storage on coffee, R. E. DOOLITTLE and B. B. WRIGHT (*Amer. Jour. Pharm., 87 (1915), No. 11, pp. 524–526*).—The authors report the results of an investigation of the effect of storage on the weight of freshly roasted coffee handled under ordinary commercial conditions. An increase in weight was observed in all samples and at all times during a period of 60 weeks.

Manual of the laws relating to the public health (*Boston: Wright & Potter Printing Co., 1915, pp. XIV+260*).—In this manual, compiled by the Massachusetts State Department of Health, are included the state laws relating to foods and drugs.

The food and drugs act (*U. S. Dept. Agr., Office Solicitor Circ. 85 (1916), pp. 6*).—This circular contains the text of a decision of the Supreme Court of the United States in proceedings instituted under section 10 of the Food and Drugs Act of June 30, 1906, as amended by the act of August 23, 1912, which has to do with misbranding as to the curative or therapeutic effect of drugs.

Sixteenth annual report on food adulteration under the pure food law, W. M. ALLEN, E. W. THORNTON, and C. E. BELL (*Bul. N. C. Dept. Agr., 36 (1915), No. 12, pp. 112*).—The work of the department carried on under the state food law during the year 1915 is reported. Definitions and standards are given, together with the results of the examination of 1,292 samples of foods and beverages.

[Food and drug inspection and pure food and other topics], E. F. LADD and ALMA K. JOHNSON (*North Dakota Sta. Spec. Bul., 3 (1915), No. 23, pp. 393–408; 4 (1916), No. 1, pp. 32*).—Both of these numbers contain data regarding the examination of a number of samples of miscellaneous food products, drugs, and patent medicines, as well as results of the sanitary inspection of a large number of grocery stores and other places where foods are prepared and sold. The first also includes the results of analyses of a number of cereal foods by R. O. Baird, the weights (claimed and found), and prices paid, and analyses of a number of solutions of soap and liquid soap preparations by C. P. Guthrie and R. Hulbert. The second publication gives information regarding the total solids and acidity of oranges and grapefruit, and includes a note by C. P. Guthrie on the effect of the presence of glycerin in alcoholic determinations of beverages.

The diet of the Swiss workingman, A. GIGON (*Die Arbeiterkost nach Untersuchungen über die Ernährung Basler Arbeiter bei freigewählter Kost. Berlin: Julius Springer, 1914, pp. 54*).—The author describes dietary studies carried out in Basel with eight normal subjects from 18 to 50 years of age, who were engaged in different occupations (masonry, tailoring, shoemaking, and farming). The experimental periods were of seven to nine days' duration, and the working day was from eight to ten hours long. The diet was unrestricted both as regards kind and quantity of food eaten.

The average amounts of food eaten furnished 106.7 gm. of protein, 94.2 gm. of fat, and 450 gm. of carbohydrate, supplying 3.157.6 calories of energy daily. A table is given which shows the average composition and energy value of diets in several different countries as found by dietary studies of a number of investigators. A bibliography is appended.

The school luncheon, AVA B. MILAM, ANNA M. TURLEY, and HELEN COWGILL (*Oregon Agr. Col. Bul. 222 (1916), pp. 24, figs. 2*).—This bulletin considers the school-lunch problem from the standpoint of the housewife or mother, the teacher of the rural school, and the teacher of the city or town school. Suggestions on the selection and preparation of the food, as well as a number of recipes, are given.

Contribution to the question of infant feeding, H. TIMPE (*Ztschr. Fleisch u. Milchhyg., 25 (1915), Nos. 17, pp. 257–262; 18, pp. 276–281; 19, pp. 289–291*).—A summary and digest of data.

The treatment of infantile beri-beri with the extract of tiqui-tiqui, J. ALBERT (*Philippine Jour. Sci., Sect. B, 10 (1915), No. 1, pp. 81–85*).—Clinical observations are reported which indicate that treatment of infantile beri-beri with extract of tiqui-tiqui (rice polishings) is very efficient, especially if the disease is taken in the early stages.

Miscellaneous notes and comments on beri-beri, R. R. WILLIAMS and J. A. JOHNSTON (*Philippine Jour. Sci., Sect. B, 10 (1915), No. 5, pp. 337–343*).—On the basis of clinical observations and animal experimentations, as yet incomplete, the authors suggest the following tentative hypothesis:

"In beri-beri there exists a toxic substance which produces the symptoms of the disease. If produced rapidly or in great quantities this toxic substance brings about a condition similar to anaphylactic shock, resulting in acute beri-beri. If gradually developed there results chronic beri-beri with progressive nerve lesions. This toxic substance may be produced by a hypothetical organism or, as may perhaps seem more probable, may be the product of normal or slightly disturbed metabolism. The vitamins are then necessary antidotes for the poison and are, therefore, to be regarded as therapeutic agents rather than foods."

The importance of lime in the nutrition of man, animals, and plants, B. HEINZE (*Naturwissenschaften, 3 (1915), No. 42, pp. 536–540*).—A summary and digest of data based largely on the work of Emmerich and Loew (E. S. R., 31, p. 860.) Examples are cited to show that it is often beneficial to add calcium salts to the daily diet.

The influence of nutrition and sickness on the growth of the brain during the first year of life, W. SAWIDOWITSCH (*Inaug. Diss., Univ. Berlin, 1914; abs. in Zentbl. Physiol., 30 (1915), No. 7, pp. 321, 322*).—As a result of experimental studies, the author concludes that the kind of diet has no influence on the growth of the brain so long as the food constituents are present in the proper proportion. A diet containing neither fat nor lipoids leads to a stand-still in brain growth; disturbances in nutrition of all kinds limit growth. In general it is thought that length, body growth, and brain volume vary independently.

The influence of the diet on the nitrogen and chlorin content of perspiration, E. BERRY (*Biochem. Ztschr., 72 (1915), No. 3–4, pp. 285–302, fig. 1*).—Experimental data are reported which indicate that the composition of the diet has practically no influence on the percentages of nitrogen and chlorin in perspiration.

The occurrence of methyl alcohol in the urine in the case of different diets, T. VON FELLENBERG (*Mitt. Lebensm. Untersuch. u. Hyg., Schweiz. Gsndhtsamt., 6 (1915), No. 1, pp. 24–37*).—From the results of feeding experiments with normal men, the author concludes that on a pectin-free diet only small amounts of methyl alcohol occur in the urine (about 0.4–1 mg. per 750 gm). When a diet rich in pectin was eaten, the amount of methyl alcohol increased to 0.8–2.5 mg. The pathological effects of methyl alcohol on the system are briefly discussed.

The question of ferment adaptation, I. KOOPMAN (*Internat. Ztschr. Phys. Chem. Biol., 2 (1915), No. 4–5, pp. 266–271*).—Experiments in vitro, undertaken to determine whether the digestive ferments adapt their composition and properties to the kind of food eaten, are reported. The action of ptyalin was found to be dependent principally upon temperature, though it is thought possible that the composition of the diet also exerts some influence.

On the mechanism of the oxidation processes in the animal organism, LINA STERN (*Über den Mechanismus der Oxydationsvorgänge im Tierorganismus. Jena: Gustav Fischer, 1914, pp. VI+61, figs. 12*).—This is a compilation of the results of investigations carried out by the author on the subject for a number of years, and which formed the subject matter of an address before the Physiological Society of Berlin, in 1913. The author has aimed to restrict herself to the discussion of experimental results and to avoid, as far as possible, theoretical speculations.

Gastro-intestinal studies.—X, An investigation of the gastric residuum in over 100 normal cases, C. C. FOWLER, M. E. REHFUSS, and P. B. HAWK (*Jour. Amer. Med. Assoc., 65 (1915), No. 12, pp. 1021–1025, figs. 7*).—Experiments to determine the properties of the gastric residuum are reported which were made with subjects receiving no water between the evening meal and 8 o'clock the following morning. The average volume of the residuum was found to be 52.14 cc., and this possessed all the qualities of a physiologically active secretion. A detailed description of its properties is given.

Psychological effects of alcohol.—An experimental investigation of the effects of moderate doses of ethyl alcohol on a related group of neuro-muscular processes in man, R. DODGE and F. G. BENEDICT (*Carnegie Inst. Washington Pub. 232 (1915), pp. 281, pls. 6, figs. 16*).—This publication outlines the plan of an exhaustive investigation of the physiological action of ethyl alcohol, which is being carried out by the Nutrition Research Laboratory. A large quantity of data is reported regarding the effect of the ingestion of alcohol on the neuro-muscular tissues, with special reference to its effect on mental processes as measured by psychological tests. The technique employed in the experiments is fully described.

ANIMAL PRODUCTION.

Grain screenings, with results of feeding experiments (*Canada Dept. Agr. [Pub.], 1915, June, pp. 44*).—In the first part of this publication, J. R. Dymond reports the composition of scalpings, succotash flax, buckwheat screenings, and black seeds, and describes the use of screenings in sheep and cattle feeding and in admixtures with other feeds.

In grinding screenings it is said to be impossible to pulverize all of the seed when the entire screenings are ground up together by an ordinary chopper. This difficulty is due to the hard flinty seed coat of some, such as lamb's quarters, and the very small size of others, as tumbling mustard.

An analysis of 396 samples of bran, shorts, and chop feed, which had been collected throughout Canada, showed that 140 of these samples contained noxious weed seeds, the average number being 57 per pound. Twenty-four of the samples contained more than 100 noxious weed seeds per pound, and one sample of chop feed held 1,104 seeds of wild oats, stickseed, catchfly, and stinkweed per pound. Only 144 samples were free from vital weed seeds of any kind. The following seeds were most common: Wild oats, wild mustard, hare's-ear mustard, false flax, stinkweed, ball mustard, catchfly, docks, ragweed, Canada thistle, stickseed, western false flax, tumbling mustard, lamb's quarters, wild buckwheat, green foxtail, lady's thumb, chess, American dragonhead, and worm-seed mustard.

The second part of the publication gives the results of feeding experiments, by E. S. Archibald and F. C. Elford, carried on during the winter of 1914–15, in which elevator screenings and their commercial separations were fed to dairy cows, hogs, and lambs. It was found that black seeds for sheep were very

unpalatable whether fed alone or in the complete screenings, and however fed were detrimental. When made palatable with an addition of molasses it was clearly proved that the greater the quantities consumed the less gain and profits result. Black seeds fed to swine were also very unpalatable, however fed, and in all experiments showed little or no food value and often detracted from the value of the other constituents in the ration. Black seeds for dairy cows were very unpalatable whether fed alone or in the complete screenings, and when compelled to eat a small quantity, the cows fell off in milk. It is said that cows will produce more on two-thirds of their regular grain ration than when they receive the full quantity of a grain ration composed of one-third black seeds.

Complete finely ground screenings were, to all classes of stock, somewhat unpalatable, due to black seeds. It required several weeks for animals to overcome their dislike of these seeds. Complete screenings proved a valuable food, but best when comprising only a part of the total meal ration. Complete screenings for lambs, when compared with grains and roughages at market values, had a value of $39 per ton when comprising 50 per cent of the grain ration and $26 per ton when comprising the total grain ration. Complete screenings for swine gave fair returns. When mixed with feed flour in proportions of 3 : 1, the mixture was worth $18.40 per ton, and had the black seeds been removed, it is thought this would have been increased $10 per ton in value. Complete screenings for dairy cattle were somewhat unpalatable, due to black seeds. When composing 20 per cent of the grain ration the screenings acquired a value of $34 per ton. The addition of molasses made the ration palatable but detracted from the food value, making the mixture of screenings and molasses meal worth only $25 per ton. This is deemed clear evidence that the most economical way of making screenings more palatable is not to add other constituents but to remove the black seeds.

In lamb feeding experiments it was clearly proved that screenings with black seeds removed are worth $10 more per ton than the complete screenings. The increased palatability alone would account for most of this difference. This would apply equally well to the feeding of screenings to other classes of stock. In the feeding of young pigs buckwheat screenings is considered a valuable meal, estimated at $27.60 per ton, and it is thought that this feed would have proportionate value in feeding sheep and cattle.

In experiments with poultry it was found that a ration composed entirely of wild buckwheat was very palatable, as were also rations of wild buckwheat, corn meal, and ground oats 2 : 1 : 1, and of scalpings, corn meal, and oats 2 : 1 : 1. Wherever either of the mustards or lamb's quarters was present in the mixture the birds practically refused the food, and even when they were forced to take it by the use of the crammer they disliked the food so much that they lost flesh as long as the operation was continued. The results indicate that any ration including black seeds should not be fed, and though it is sometimes recommended to mix mustard with poultry feeds the use of commercial mustard when fed in moderation is not considered as objectionable as this wild mustard proved to be in this experiment. The quality of the flesh produced from the wild buckwheat seemed to be as good as that with the ordinary mash.

Operating an efficient cleaner as an attachment to a grain thresher is suggested as a possible solution of the screening problem.

[Feeding value of the foliage root crops], M. Hoffmann (*Bl. Zuckerrübenbau. 22 (1915), No. 18, pp. 201–205*).—The composition and feeding value are given of the following feeding materials: Fresh and ensiled beet tops, rape tops, cabbage, fresh and dried potato foliage, and fresh, dried, and ensiled sugar beet tops.

Some facts and theories about silage, T. A. Kiesselbach (*Ann. Rpt. Nebr. Corn Improvers' Assoc., 6 (1915), pp. 108–131, figs. 3*).—A résumé of experiment station work on the value and use of silage. A bibliography of literature on silos and silage is included.

Silage in relation to farm management, G. F. Warren (*Ann. Rpt. Nebr. Corn Improvers' Assoc., 6 (1915), pp. 94–108, fig. 1*).—A résumé of experiment station material showing the place of silage in the economics of the farm and its cost, food value, and use.

Cassava pulp from the manufacture of fecula, A. de Villèle (*Rev. Agr. Réunion, 2. ser., 3 (1915), No. 10, pp. 359–369*).—Analyses are given of cassava pulp, together with comments on its feeding value for various classes of live stock.

Concentrated feeding stuffs and registrations for 1915, C. S. Cathcart et al. (*New Jersey Stas. Bul. 283 (1915), pp. 3–90*).—Analyses are given of alfalfa meal, bread meal, brewers' dried grains, buckwheat middlings, buckwheat offal, ground corncob, corn-and-cob meal, corn bran, corn meal, corn (sifted cracked), gluten feed, coconut meal, cotton-seed meal, distillers' dried grains, dried beet pulp, feeding flour, hominy meal and feed, linseed meal, malt sprouts, meat meal and beef scrap, malt grains, oat hulls, peanut meal, bone meal, rye bran, rye middlings, ground screenings, shredded wheat waste, wheat bran, wheat middlings, and various mixed and proprietary feeds.

Nutrition investigations (*Kansas Sta. Rpt. 1914, pp. 19, 20*).—The results of four feeding trials, including 90 pigs, indicate that young pigs fed corn meal without other feed or corn meal supplemented with various ash ingredients are much below normal development at the close of the six months, whereas young pigs fed corn meal supplemented with proteins low in ash develop normally during six months' feeding. These results indicate that a protein deficiency, quantitative or qualitative or both, is the chief limiting factor. The influence of the ash in combination with the protein has not been determined.

Results of two feeding trials, not completed, with 12 steers indicate that scanty feeding does not materially hinder growth in height, but greatly retards the development of the middle and width of the body; that one year of maintenance feeding, if followed by liberal feeding, does not materially stunt the animal, but does not allow maximum development of the width of the body, and that two years of maintenance feeding, followed by liberal feeding, results in permanent stunting, which is indicated by lack of normal height, contracted middles, and narrow bodies.

[Experiments with swine and steers], E. S. Good (*Kentucky Sta. Rpt. 1914, pt. 1, pp. 38–42*).—In a series of experiments to determine the value of distillers' dried grains as a feed, alone and in combination with other feeds, for hogs on pasture, four lots of from 10 to 15 pigs each were fed for 73 days. Lot 1 was allowed the run of a pasture of rape and oats, and fed all the distillers' dried grains it would eat without waste. Lot 2 was allowed the same kind of pasture and given from 2.5 to 3 per cent of its weight in corn meal per day; lot 3 was given a similar pasture and allowed from 2.5 to 3 per cent of its weight per day of a mixture of corn meal and distillers' dried grains 5:1. For comparative purposes, the fourth lot was confined in a dry lot and given a full feed of corn meal and distillers' dried grains 5:1. These lots made average daily gains per head of 0.456, 0.931, 1.027, and 0.883 lbs., requiring 3.68, 3.44, 3, and 4.44 lbs. of grain per pound of gain, and costing, not considering the cost of the pasture, 4.97, 4.95, 4.27, 6.32 cts. per pound of gain for the respective lots. The results of this experiment indicate that distillers' dried grains are not well relished by the hog, and that it is not so satisfactory a feed for hogs on pasture as is corn alone, or a mixture of corn meal and distillers' dried grains 5:1.

Four lots of 9 and 10 pigs each were fed 70 days as follows: Lot 1 whole wheat soaked for 24 hours, lot 2 ground wheat dry, lot 3 ground wheat soaked for 12 hours, and lot 4 ground wheat and tankage 14:1 soaked for 12 hours. These lots made average daily gains per head of 1.5, 1.72, 1.68, and 1.78 lbs., each bushel of wheat fed realizing $1.19, $1.36, $1.33, and $1.41 for the respective lots.

Four lots of 2-year-old steers were fed during the year to determine the value of a ration composed of broken ear corn, cotton-seed meal, cotton-seed hulls, and a limited amount of clover hay, as compared with a ration of the same feeds with the exception of the silage. Two lots were finished in the dry lot and two on pasture. In the dry lot test, the cost per pound of gain made by the lot of cattle receiving silage was 1.66 cts. less than the cost of gain made by the cattle which did not receive silage in the ration. Both of these lots were given a full feed. The two other lots of steers were given a 3/4 full feed of the rations mentioned above during the winter and early spring, and were finished on grass without grain to determine the functional ability of cattle to graze after having had silage the previous winter, as compared with steers receiving dry feeds, i. e., the same feeds with the exception of silage. The lot which received silage during the winter did not make as large gains on pasture as the lot receiving the same feeds with the exception of silage during the winter, the difference being 23 lbs. per steer. The lot of steers which received silage during the winter netted a profit of $5.88 per steer, while the nonsilage-fed lot made a profit of $1.31 per steer. There was no difference in the finish of the steers in the two lots when sold.

[Feeding trials with cattle and hogs] (*Kentucky Sta, Bien. Rpt. 1914–1915, pp. 16–18, 22–24, figs. 3*).—In steer feeding experiments one lot of steers received broken ear corn, cotton-seed meal, cotton-seed hulls, and clover hay; a second lot received the same feeds with the addition of corn silage, limiting the ear corn, however, to the amount fed the first lot less that contained in the silage. The addition of the silage very materially reduced the cost of gains during the winter season, the saving amounting in one test to 3.61 cts. per pound of gain and in a later test to 4.25 cts. In one experiment the lot receiving the silage did not gain on pasture the following summer within 22 lbs. per head of the lot which did not receive silage, while in a second experiment the lot receiving the silage made 49 lbs. more gain per steer on pasture than the lot receiving no silage. Further investigations are contemplated.

It appeared that broken ear corn was not a good form in which to feed corn to steers on full feed when receiving corn silage as a part of the ration, for the reason that under such conditions the steers ate a small amount of silage, due in part to the filling effect of the cobs. In contrast to these results it was found that the feeding of shelled corn with silage was advantageous, as the lot so fed gained at the rate of 2.36 lbs. per steer daily, as compared with 1.97 lbs. for the lot receiving broken ear corn, and the gains were also made at 2.69 cts. less per pound of weight. The cattle receiving the shelled corn were also in better finish at the close of the experiment. The lessening in the cost of gains was due in part to a decreased consumption of corn, and in part to an increased consumption of silage, the lot receiving shelled corn consuming an average of 36.3 lbs. of silage per steer daily and the lot receiving broken ear corn, 22.6 lbs.

In a study of the value of distillery slop as a feed for hogs the conclusion was reached that the slop can be fed at a fair profit, provided that the ration is properly balanced, and that there is no danger from hog cholera if proper preventive methods are resorted to.

Substitutes for milk in the rearing of dairy calves, J. B. Lindsey (*Massachusetts Sta. Bul. 164 (1915), pp. 49–65, pls. 5*).—These pages contain results of observations covering a series of years in the raising of calves for dairy purposes. A description is given of the method followed and the cost of raising calves to six or eight months of age on skim milk, ordinary grains, and hays; also the testing of several proprietary calf meals as milk substitutes and of several homemade calf meal preparations. The following table summarizes the results of these experiments:

Summary of calf-feeding experiments with milk substitutes.

Kind of ration.	Number of calves.	Days in trial.	Daily gain.	Total food cost.	Cost of food per pound of gain.
			Lbs.		*Cents.*
Skim milk in large supply, ordinary grains, and hay	10	235	1.22	$22.08	7.7
Skim milk and Hayward's calf meal	2	173	1.23	20.44	9.6
Skim milk, Schumacher's calf meal	3	150	1.00	12.27	8.2
Skim milk and Blatchford's calf meal	1	....	1.15	....	....
Whole and skim milk and Bibby's cream equivalent	3	148	1.21	13.08	7.5
Whole and skim milk and Lindsey's meal I	2	147	.97	14.54	10.4
Whole and skim milk and Lindsey's meal II	3	183	1.04	14.68	7.6
Whole and skim milk and Lindsey's meal III	1	148	1.70	15.24	6.1
Whole and skim milk and Lindsey's meal IV	1	148	1.50	14.49	6.5
Whole and skim milk and Lindsey's meal V	4	164	1.25	15.12	7.6
Whole and skim milk and Lindsey's meal VI	3	157	1.35	16.54	7.6

Hayward's calf meal was composed of finely ground wheat, coconut meal, Nutrium, linseed meal, and blood flour (E. S. R., 14, p. 479). The calf meals prepared by the author were of the following compositions: No. 1, fine corn meal, flour middlings, flaxseed meal, cheap flour, glucose sugar, and salt 10 : 10 : 15 : 10 : 5 : 1; No. 2, ground oat flakes, flaxseed meal, cheap flour, glucose sugar, and salt 25 : 15 : 8 : 2 : 1; No. 3, fine corn meal, flour middlings, flaxseed meal, cheap flour, glucose sugar, and salt 8 : 10 : 14.5 : 10 : 7 : 0.5; No. 4, fine corn meal, flour middlings, flaxseed meal, cheap flour, and salt 10 : 10 : 14.5 : 15 : 0.5; No. 5, ground oat flakes, flaxseed meal, flour middlings, fine corn meal, prepared blood flour, and salt 22 : 10 : 5 : 11 : 1.5 : 05; No. 6, ground oat flakes, barley malt, blood flour, bicarbonate of potash, and salt 35 : 12.5 : 1.5 : 0.5 : 0.5.

In general the results indicate that calf meals may be purchased or prepared that will take the place of a considerable amount of whole or skim milk and not interfere with the normal growth of the calf. It is suggested that it is not advisable to attempt to rear the calves during the first four months without the daily use of from 3 to 5 qt. of skim milk. A too early attempt to accustom the calf to an exclusive diet of calf meal is likely to produce digestive disturbances that may affect the health of the animal in after life. It was found that Holstein and Ayrshire calves are, as a rule, better able to utilize prepared feeds than are the Jersey and Guernsey.

Analyses of the various calf meals are given.

Sheep feeding experiment, A. D. Faville (*Wyoming Sta. Bul. 109 (1915), pp. 45–59*).—Four lots of 25 lambs each were fed 112 days, lot 1 receiving shelled corn, alfalfa, and oat and pea silage; lot 2, shelled corn and alfalfa; lot 3, alfalfa and silage; and lot 4, whole barley, alfalfa, and silage. They made average daily gains per head of 0.25, 0.27, 0.17, and 0.23 lb., lot 1 requiring 1.91 lbs. of grain, 7.3 lbs. of alfalfa, and 2.84 lbs. of silage; lot 2, 1.76 lbs. of grain and 8.54 lbs. of alfalfa; lot 3, 13.76 lbs. of grain and 4.39 lbs. of silage, and lot 4, 2.09 lbs. of grain, 8.02 lbs. of alfalfa, and 3.12 lbs. of silage per pound of gain, and costing 7.33, 7.32, 9.13, 8.04 cts. per pound of gain for the respective

lots. At the close of the 112-day feeding period, lot 3 lacked finish and so was put on a grain ration for 28 days. While the gains were much better than they had been previously, financial returns did not justify the added expense.

Two lots of 20 breeding ewes each were fed 56 days, lot 1 receiving 4.5 lbs. of alfalfa and lot 2, 3 lbs. of alfalfa and 1.5 lbs. of oat and pea silage per head per day. They made total gains per sheep of 8 lbs. and 3 lbs., costing 18.9 cts. and 14.7 cts. per week per ewe, respectively. Both rations proved to be satisfactory for maintenance requirements. There was apparently no difference in the strength and quality of the lambs dropped by the two lots, the percentage of lambs being unusually high for the whole flock.

Two lots of 12 and 11 rams each were fed 98 days, lot 1, receiving mill feed, oats, and corn meal, 5:2:3, alfalfa, and oat and pea silage, and lot 2, grain as in lot 1 and alfalfa. They made average daily gains per head of 0.24 and 0.32 lb., requiring 2.48 lbs. of grain, 12.21 lbs. of alfalfa, and 4.08 lbs. of silage, and 1.93 lbs. of grain and 14.05 lbs. of alfalfa per pound of gain, and costing 11.24 and 10.84 cts. per pound of gain for the respective lots.

It is estimated from the results of the foregoing experiments that oat and pea silage has a value of $4 per ton when first-class alfalfa is worth $12. With a larger percentage of peas in the silage its value ought to be correspondingly increased.

Analyses of the feeds used are appended.

Branding paints, A. D. FAVILLE (*Wyoming Sta. Rpt. 1915, pp. 119–123, figs. 5*).—Comparative tests were made of several varieties of branding paints. It was found that brands applied to sheep before, immediately after, or several days after dipping, were equally effective. Sheep of the fine wooled type carried the brands best, as brands on long, loose, open fleeces quickly become indistinguishable. Of the three sheep marking paints tested, two scoured out quite readily while the third did not scour satisfactorily.

Annual wool review for 1915, with estimate of domestic wool production and other statistical records, W. J. BATTISON (*Bul. Nat. Assoc. Wool Manfrs., 46 (1916), No. 1, pp. 1–66, pl. 1*).—Complete statistical data are given on domestic and foreign wool production, consumption, and prices.

The mineral nutrients in the feeding of swine, E. B. FORBES (*Mo. Bul. Ohio Sta., 1 (1916), No. 2, pp. 61–65, fig. 1*).—A popular discussion, based largely on work previously noted (E. S. R., 33, p. 375).

Live stock of the farm.—III, Horses, edited by C. B. JONES (*London: The Gresham Publishing Co., 1915, vol. 3, pp. VIII+259, pls. 29, figs. 13*).—This book treats of the breeds of heavy and light horses, their breeding, feeding, care, and management, together with a chapter on the common diseases of the horse.

Studies on the physiology of reproduction in the domestic fowl.—XIV, The effect of feeding pituitary substance and corpus luteum substance on egg production and growth, R. PEARL (*Jour. Biol. Chem., 24 (1916), No. 2, pp. 123–135, figs. 2*).—In continuation of work previously noted (E. S. R., 33, p. 472), the author finds that "feeding the desiccated substance of the anterior lobe of the pituitary body of cattle to hens in laying condition but at a time of year when the rate of fecundity is declining, does not stimulate the ovary to an increased rate of production. Feeding the same substance (pituitary body, anterior lobe) to growing pullets does not bring about any earlier activation of the ovary than occurs in normal control pullets not fed this substance.

"The anterior lobe of the pituitary body from cattle when fed to growing chicks is accompanied by a distinct retardation in growth in body weight. This confirms for the chick the results which have been obtained with this substance by other investigators in mammals. The feeding of the desiccated substance of corpus luteum brings about a retardation of growth about twice as great in

amount as that following pituitary feeding, as above noted. Neither pituitary substance (anterior lobe) nor corpus luteum substance when fed to laying pullets causes any retardation in the attainment of sexual maturity as indicated by the laying of eggs. The birds so fed begin to lay eggs at the same age, but at a smaller body weight than the normal controls."

Some of the essential safeguards for the critical conduct of organ substance experiments with poultry are discussed.

Range v. confinement for laying hens, W. J. BUSS (*Jour. Amer. Assoc. Instr. and Invest. Poultry Husb., 2 (1915), No. 3, pp. 23, 24*).—In an experiment at the Ohio Experiment Station it was found that hens on range produced 15.5 per cent more eggs and consumed 0.9 per cent less feed (aside from grass) than did the lot in confinement. Percentage mortality was about 50 per cent higher with the lot in confinement.

In a second experiment the lot on range produced 30.9 per cent more eggs and consumed 2.3 per cent more feed (aside from grass) than did the lot in confinement. Mortality was slightly higher in the lot on range during the period covered by these figures. However, this experiment has been continued, and, up to the present time, seven hens have died in the confined lot and five in the range lot. While these figures show rather conclusively that better results will be secured by allowing laying hens to have range, yet the results indicate that where it is not possible to secure range, hens can be kept at a profit in rather close confinement.

Comparison of methods of managing pullets, MRS. G. R. SHOUP (*Washington Sta., West. Wash. Sta., Mo. Bul. 3 (1916), No. 10, pp. 13–20, figs. 2*).—A test beginning in November was made of two flocks of 100 hens each, one under good farm conditions, the other under special management. This included a somewhat more varied ration and the use of artificial light (gasoline lantern) in the houses early in the morning and late at night, thus lengthening the period of light by several hours. The total cost of feed for the 5-week period for lot 1 was $16.77 and for lot 2, $19.97, but the number of eggs laid by lot 1 was 652 as compared with 1,592 by lot 2. The profit of lot 1 was but $7.04 and that of lot 2, $38.05, thus indicating the effectiveness of the system of special management adopted.

The experiment is being continued.

Seasonable variation in the quality of farm eggs, W. S. YOUNG (*Jour. Amer. Assoc. Instr. and Invest. Poultry Husb., 2 (1916), No. 4, pp. 27–30*).—From data obtained from the Poultry Producers Association of Ithaca, N. Y., "there seems to be a decided tendency to have the highest quality eggs in the months of January and February. As production increases there are more blood spots, check, and browns, and the quality gradually drops until in the last of May, when the weather gets warm, there is a decided drop which under normal conditions would continue undoubtedly throughout the summer, gradually improving in early fall as the weather becomes cooler and the percentage of blood spots drops off. In October and November the quality improves considerably and then takes a slump in early December, due to the selling of held eggs and the large number of pullets' eggs. Then after prices reach their height the eggs are not held, there are fewer pullets' eggs and more hens' eggs, and we get the highest quality of the year."

Poultry on the farm, H. ATWOOD (*West Virginia Sta. Circ. 22 (1915), pp. 8, fig. 1*).—General directions for feeding, care, and management are outlined.

Some facts from a country village survey, R. S. MOSELEY (*Jour. Amer. Assoc. Instr. and Invest. Poultry Husb., 2 (1916), No. 4, pp. 30–32*).—Data from a poultry survey of a country village, made by the New York Cornell Experiment Station, are given.

DAIRY FARMING—DAIRYING.

Treatise on dairying, W. FLEISCHMANN (*Lehrbuch der Milchwirtschaft. Berlin: P. Parey, 1915, 5. ed., rev., pp. XII+597, pls. 2, figs. 59*).—This is the fifth edition of this work, revised and brought up to date. An English translation of the first edition, by C. M. Aikman and R. P. Wright, has been previously noted (E. S. R., 8, p. 835).

Relative value of feeds for dairy cows, E. S. SAVAGE (*Amer. Soc. Anim. Prod. Proc. 1914, pp. 69–72*).—The author points out the close agreement in the amount of food deemed necessary under the Armsby, Kellner, Eckles, and Scandinavian feed unit systems and the Haecker and Cornell standards. A table is given showing the relative values of some of the common feeds for dairy cattle.

Report on further experiments on the feeding of dairy cows at Offerton Hall, F. P. WALKER (*Durham County Council, Ed. Com., Offerton Bul. 5 (1915), pp. 40*).—This is a continuation of work previously noted (E. S. R., 29, p. 172).

It has been definitely determined that the total quantity of milk is not influenced by equal or unequal periods of milking, but that the fat percentage is materially altered by the length of time between morning and evening milkings. Cows milked at even periods gave more milk in the evening than in the morning. The evening's milk was slightly the poorer in quality.

A note, by S. H. Collins, on the variations in the amount of fat in milk due to variations in the times of milking (E. S. R., 25, p. 177) is included.

In an experiment to determine the effect of feeding phosphates directly to cows, precipitated bone phosphate was fed at the rate of 1 oz. per day. No appreciable result was obtained either on the quantity or quality of the milk produced. Apparently this material had no effect on the stimulation of the nervous system; if anything, it had a depressing effect. The weight of cows receiving the precipitated bone ash showed a slight increase.

Experiments showed no advantage in milking three times a day as compared with twice a day.

Cows fed palm nut cake did not increase in weight as did those fed cotton cake but they showed a looser skin with a glossier look. The palm nut cake gave a higher percentage of fat in the milk.

[Experiments with dairy cattle], J. J. HOOPER (*Kentucky Sta. Rpt. 1914, pt. 1, pp. 53, 54*).—In an experiment in feeding all the cows first on ground wheat and then on wheat bran, it was found that one of these feeds might easily be substituted for the other. For every pound of bran that was supplied in the grain mixture the cows produced 3.23 lbs. of milk and for every pound of ground wheat 3.01 lbs.

With a view to determining whether the period of œstrum would make a considerable fluctuation in the milk and milk fat yield, 54 records have been kept during the past three years. It was found that with some cows this does cause a considerable variation, while with others it seems to have very little effect.

Records with 203 cows did not verify the conclusions of Guenon that there is a correlation between the form of the escutcheon and milk and butter production.

Beets and mangels compared with silage for milk production, C. C. HAYDEN (*Mo. Bul. Ohio Sta., 1 (1916), No. 2, pp. 49–53*).—The results of experiments conducted in 1889, 1890, 1891, and 1892, in comparing beets and mangels with silage for milk production, a portion of which have been previously reported (E. S. R., 5, p. 887), are summarized. They show daily differences in the milk flow per cow in favor of beets of from 0.15 to 1.34 lbs.

These experiments, together with those summarized from other stations, are taken to indicate that sugar beets and mangels tend to increase the flow of milk, and that the increase is due to the stimulating effect on the appetite, causing a larger consumption of food. In some cases the cows made greater gains in body weight while consuming beets, and in other cases greater gains while consuming silage. It appears that there is little difference in the value of an equal amount of dry matter in each. Because of the greater cost of beets, it is not deemed wise to attempt to substitute them for silage except where maximum production of milk is desired, or where the number of cows is too small to permit the use of a silo.

Influence of beet feeding on the milk, J. ROLLE (*Ztschr. Untersuch. Nahr. u. Genussmtl., 30 (1915), No. 10, pp. 361, 362*).—It is stated that ordinary beets contain from 1.4 to 6.7 per cent of betain, and sugar beets from 0.1 to 0.3 per cent. This is said to cause the bitter flavor in milk produced from cows fed on beets. The *Streptococcus lactis* bacteria in the milk affect the betain, which develops a lactic acid betain with the elimination of carbonic acid and ammonia. It is this lactic acid betain which gives the milk its characteristic odor.

Soiling v. silage as a supplement for Nebraska pastures, J. H. FRANDSEN (*Ann. Rpt. Nebr. Corn Improvers' Assoc., 6 (1915), pp. 37–46, figs. 3*).—The author outlines a plan for soiling crops on a basis of ten cows. The advantages and disadvantages of soiling are enumerated and compared with those of silage. It is concluded that while the soiling system has some advantages over silage, it is not entirely feasible to adopt it exclusively, and a combination of the two systems is suggested.

The feeding of molasses feed to dairy cattle, J. J. O. DE VRIES (*Verslag Ver. Exploit. Proefzuivelboerderij Hoorn, 1913, pp. 15–33*).—An experiment is reported in which molasses was fed to dairy cattle, resulting in a marked increase in yield of milk over those fed an ordinary hay ration. The milk was higher in both fat and dry matter content.

The cost of rearing a dairy cow, J. B. LINDSEY (*Massachusetts Sta. Bul. 164 (1915), pp. 66–71*).—The total food cost of raising 20 dairy heifers, together with data from other sources relative to food and other costs, is given.

It is concluded that from $75 to $85 represents the total cost of raising the average dairy heifer until she reaches the age of two years. In the averages the initial value of a heifer was placed at $4, the food cost at $57.73, and other costs at $20.51, making a total of $82.24, or when the manure is credited at $8, a total net cost of $74.24.

Is the ability to produce milk fat transmitted by the dam or by the sire? T. E. WOODWARD (*Hoard's Dairyman, 51 (1916), No. 4, p. 146*).—From a study of the Advanced Registry records of the American Guernsey Cattle Club the author found that in 57.3 per cent of the total number of comparisons made the high-producing daughters were from dams with the highest records. It was noted, however, that while there was a difference of 118 lbs. of fat per annum between the high- and low-producing dams, there was a corresponding difference of only 18 lbs. between the daughters. This indicates that the sire also has something to do with the inheritance of dairy qualities.

Milk fat as a measure of value of milk, L. L. VAN SLYKE (*Milk Trade Jour., 3 (1916), Nos. 11, pp. 6, 10; 12, pp. 14, 15*).—In this article it is shown that the fat and the solids-not-fat do not vary in the same proportion in different milks, although in general when milk grows richer in fat it also grows richer in skim milk solids. Milk containing 3 per cent of fat contains more solids-not-fat in proportion to fat than do milks containing more than 3 per cent of fat. Generally, 1 lb. of milk fat is worth ten times as much as 1 lb. of

solids-not-fat, hence the richer milk has a greater commercial value. Payment on the basis of weight or volume alone is deemed unjust to the richer milks, because the varying proportion of solids-not-fat in relation to fat is not taken into consideration. When fat alone is used as a basis of payment the extra proportional amount of solids-not-fat in poorer milks is not recognized, and milks richer in fat get somewhat more than is due them for their skim milk solids or solids-not-fat.

It is concluded that a strictly accurate basis of payment doing full justice to each milk according to its composition must consider both fat and skim milk solids or solids-not-fat, allowing for each pound of solids-not-fat one-tenth the amount allowed for fat. The solids-not-fat must be determined in each case as well as the fat.

Problems of a rural milk supply.—The keeping quality of milk and its transport, R. G. Allan and J. V. Takle (*Agr. Jour. India, 10 (1915), No. 4, pp. 329–342*).—In connection with experiments carried on at the college dairy at Nagpur in the hot weather of 1915, it was found that the tendency to form butter during transport varies with the temperature at which the milk is transported, the degree of fullness of the milk container, the length of time after milking at which transport is done, and the kind of milk transported. Butter was found in all milks below 90° F., but more so in buffalo's than cow's milk and in the milk of one individual more than in another. Pasteurization has been found effective in reducing the tendency of transported milk to form butter.

The significance of bacteria in milk, L. A. Rogers (*Cream. and Milk Plant Mo., 4 (1915), No. 4, pp. 15–18*).—In this paper, which was presented at the fourth annual convention of the International Association of Dairy and Milk Inspectors, at Washington, D. C., in October, 1915, as previously noted (E. S. R., 33, p. 705), the author shows wherein the bacteriological examination of milk is not an entirely reliable test of the sanitary condition of milk. This is because of the inaccuracies that enter into the examination, the lack of definite knowledge concerning the habitat of certain bacterial groups, and the unknown factor of bacterial multiplication. How much of a high count is due to original contamination and how much to multiplication is deemed uncertain. It is suggested that it may be necessary to distinguish between measures to reduce the bacterial count and measures in the interest of decency and cleanliness.

Bacteriology of cream ripening, K. Peiser (*Milk Dealer, 5 (1916), No. 4, pp. 26, 27*).—Data on the bacterial count of cream during the various stages of ripening and churning, and including butter in storage, are given.

A large part of the bacteria present in ripened cream is removed after churning from the butter with the buttermilk. Many more are washed out of the butter by the washing that occurs during the working of it. The more impure the cream the greater is the importance of getting the butter thoroughly washed, since a great percentage of the bacteria is removed in this way. It has been shown that the bacterial content of water used for washing of the butter has an influence on the keeping quality. Butter as a finished product contains a little more than one-tenth as many organisms as ripened cream does. In butter the salt and low temperature have a deleterious effect on the starter type and as a result they die off rapidly at first, then more gradually, until after some time in storage the ratio of their numbers compared with the numbers of other types is very much reduced.

Determination of the theoretical butter overrun, P. Rinckleben (*Molk. Ztg. [Hildesheim], 29 (1915), No. 82, pp. 1029, 1030*).—Formulas are given for estimating the probable overrun in butter.

The pasteurization of dairy by-products, W. D. DOTTERRER and R. S. BREED (*New York State Sta. Bul. 412 (1915), pp. 581–610*).—The work reported in this bulletin, which was conducted in cooperation with the New York State Commission for the Investigation of Bovine Tuberculosis, was planned in order to study the effect of pasteurization on the whey and skim milk, the efficiency of the present methods of pasteurization, and the best methods of pasteurization.

Visits were made in the course of this inquiry to seven Cheddar cheese factories and to two skimming stations at which pasteurization of whey or skim milk was being carried out. According to the 1915 list there are about 950 cheese factories in the State, of which 55 are known to be pasteurizing whey. Thirty-one of these factories make Cheddar, 13 make Swiss, 9 make Limburger, and 2 make brick cheese. At but one of the cheese factories visited were the temperatures used in pasteurization high enough to meet the lowest requirement (178° F.) usually specified by law. At this factory the temperature used only occasionally reached this figure. All but two factories, however, were using temperatures which would meet the requirements of the Michigan law (145° for 30 minutes). The two factories which used lower temperatures than this were also losing part of the value of the pasteurization by adding separator slop or water after the temperature was so low as to be ineffective in killing bacteria. One other factory followed this same practice so that the pasteurization which would have otherwise been effective was rendered unsatisfactory. The four factories which were securing satisfactory results were all pasteurizing by means of a steam line running into the whey tank.

It was found that the process of heating the whey aided in preserving the whey in good condition for feeding until it was convenient to use it. This was due to the fact that the fat did not rise so quickly nor so completely on the heated as on the unheated whey, thus preventing the formation of an undesirable scum of fat on the whey tank. The heating also killed all of the organisms which ordinarily cause fermentations in the whey with the exception of *Bacillus bulgaricus*, an organism which causes a lactic acid fermentation. The growth of this organism was retarded by the heating, so that the heated whey, as delivered to the farmers, had an acidity of about 0.4 per cent while the unheated whey had an acidity of about 1.1 per cent.

The pasteurized whey was found to be free from yeasts and to undergo a practically pure lactic acid fermentation due to *B. bulgaricus*. On two successive days at one cheese factory the same organism was also found to be the predominant organism in the making vat instead of the more common *Bacterium lactis acidi*.

"The use of direct steam and the combination of direct steam and jetting were found to be the best methods of pasteurizing whey. They can be operated at a sufficiently low cost to make the process of pasteurization a highly desirable one for all parties concerned. Double jetting without supplementary heating is not satisfactory because the temperatures reached are not so high as they should be. This method has one advantage, however, in that a careless or unreliable cheese maker can not escape using the jet pumps while such a man may be tempted to shut off steam more quickly than he should where direct steam is used.

"In the course of this investigation 40 butter factories and skimming stations were found which pasteurize skim milk. This number does not include all that follow the practice. The best procedure is to return the skim milk to the patrons' cans at a temperature high enough to remain above 145° for 30 minutes. This pasteurizes the milk in the final container and increases the keeping qualities of the skim milk."

A résumé of the general subject of pasteurization, including methods of pasteurizing whey and skim milk, the effect of pasteurization on the feeding value and on the spread of disease, and the cost of pasteurization is given.

Why and how pasteurize dairy by-products, F. H. Hall (*New York State Sta. Bul. 412, popular ed. (1915), pp. 8, fig. 1*).—A popular edition of the above.

VETERINARY MEDICINE.

Report of veterinary affairs in Austria for 1908–1910 (*Ber. Österr. Veterinärw., 1908–1910, pp. 152, pls. 12*).—The report includes a census of the profitable domestic animals in Austrian Provinces as of December 31, 1910 (pp. 1–3); a tabular statement of the occurrence of contagious diseases (pp. 4–88); a report on infectious and other diseases (pp. 89–106); statistics on losses occasioned by contagious diseases (pp. 107–127); administration of veterinary police laws (pp. 128–146); and veterinarians and veterinary instruction (pp. 147–152).

The mechanism of the Abderhalden reaction.—Studies on immunity, I, J. Bronfenbrenner (*Jour. Expt. Med., 21 (1915), No. 3, pp. 221–238*).—As a result of his investigation the author concludes that "the Abderhalden reaction is specific. The properties of serum on which it depends develop in experimental animals simultaneously with antibodies during the process of immunization. It is impossible to observe by direct methods the presence of digesting ferments in the blood of immune animals. The Abderhalden test may be resolved into two phases. A dialyzable substance appears in the second phase and is the result of the autodigestion of serum. The autodigestion of serum in the Abderhalden test is due to the removal of antitrypsin from the serum by the sensitized substratum."

The nature of anaphylatoxin.—Studies on immunity, II, J. Bronfenbrenner (*Jour. Expt. Med., 21 (1915), No. 5, pp. 480–492, fig. 1*).—From experimental data submitted the author has shown that "the union of fresh serum of pregnant or immunized animals with the corresponding boiled protein (substratum) is accompanied by the formation of poisonous substances. The poison originates from the serum as a result of its autodigestion, and not from the substratum. The process of autodigestion may be determined by the specific or nonspecific removal of the antitrypsin of the serum. The poisons originating from the serum are toxic only for homologous animals. The autodigestion of the serum, if allowed to proceed far enough, may go beyond the toxic stage. The biological properties of these poisons indicate their close similarity to the anaphylatoxin, and suggest that the anaphylatoxin of Friedberger is a product of the autodigestion of serum and not of the protein outside of the serum."

The mechanism of the Abderhalden reaction with bacterial substrates, G. H. Smith and M. W. Cook (*Jour. Infect. Diseases, 18 (1916), No. 1, pp. 14–19*).—Experimental data demonstrate that the Abderhalden reaction may be divided into two phases. "The first phase involves a sensitization of substrate by its specific serum. The second phase represents an autodigestion of the serum, which is not due to specific causes." There is an absolute specificity in the sensitization of substrate. Further investigation is deemed necessary to demonstrate whether or not this sensitization is of the nature of an antigen-antibody reaction. The work confirms the studies of Bronfenbrenner noted above.

Serum proteases and the mechanism of the Abderhalden reaction.—Studies on ferment action, XX, J. W. Jobling, A. A. Eggstein, and W. Petersen (*Jour. Expt. Med., 21 (1915), No. 3, pp. 239–249*).—From experimental data

presented, together with those previously submitted, the authors believe that "the Abderhalden dialysis method and the theory underlying it, in so far as it is applicable to protease action, is without warrant of specificity, and probably depends upon purely fortuitous mechanical factors. It seems probable that in various pathological conditions proteases normally confined to the leucocytes in the human being appear in the blood, where their presence can be demonstrated by a method which removes the antiferment without injuring the ferment."

It is further concluded that "normal serum protease is not specific; it is active in both dilute acid as well as alkaline media. It is destroyed by heating to 70° C. for 30 minutes. It is markedly impaired when heated at 56° for 30 minutes. It is inhibited by the unsaturated soaps and lipoids. Guinea-pig and rabbit serum contain relatively much protease; the leucocytes are without proteolytic ferments. Normal human and dog serum contain little or no protease; the leucocytes are strongly proteolytic. Serum complement and protease are not identical. During various pathological conditions the nonspecific protease is increased in both human and dog serum. An increase in antiferment is in many instances coincident.

"During the Abderhalden reaction the placental tissue becomes more resistant to enzym action, because of the adsorption of the antiferment from the serum. The dialyzed serum loses antiferment because of adsorption by the placental tissue or other adsorbing substances, including probably the dialyzing membrane. The digestive substrate is the serum protein made available for protease action by the adsorption of the antiferment. The proteases in pathological conditions investigated by us (pregnancy, tuberculosis, and pneumonia) are nonspecific."

Further observations on the action of the blood serum after the intravenous injection of cane sugar, F. RÖHMANN (*Biochem. Ztschr., 72 (1915), No. 1–2, pp. 26–100, pl. 1*).—Confirming the observations of previous investigators the author has further shown that after the intravenous injection of cane sugar the blood serum is not only able to cleave cane sugar into dextrose and levulose, but also to cause a synthesis of lactose from these two hexoses. There is then, apparently, a conversion of ketose into aldose in the animal organism. These phenomena are explained by assuming that certain unknown "stereokinases" appear in the blood, after the injection, which are able to cause certain stereorearrangements in the carbohydrate molecule. After the intravenous injection of cane sugar the blood not only contains invertin but also certain stereokinases and a lactase.

The occurrence of pituitrin and epinephrin in fetal pituitary and suprarenal glands, C. P. MCCORD (*Jour. Biol. Chem., 23 (1915), No. 2, pp. 435–438*).—The active principle of the pituitary body of the bovine fetal gland was found to be present from the eighth week to full term. For the suprarenals this period was found to be from the sixth week to full term. "The presence of the active principles of these glands at so early a developmental period suggests that the fetus in utero may be under the influence of its own internal secreting glands as well as the maternal glands."

Details as to weights, ages, etc., are grouped in tabular form.

The bactericidal properties of some common antiseptics and disinfectants, H. LOTHE and B. A. BEACH (*Vet. Alumni Quart.* [*Ohio State Univ.*], *2 (1915), No. 4, pp. 147–154*).—A general account.

Experimental observations on the antiseptic action of hypochlorous acid and its application to wound treatment, J. L. SMITH, A. M. DRENNAN, T. RETTIE, and W. CAMPBELL (*Brit. Med. Jour. No. 2847 (1915), pp. 129–136*).—"Comparative tests confirm the conclusion already arrived at by various inves-

tigators that hypochlorous acid is the most powerful antiseptic known. Practical methods of using this antiseptic have been devised. It can be used either as a gas or as a solution. The advantage of using the gas is that it will penetrate and will act at a distance. Both the gas and the solution, while extremely potent against organisms and their spores, cause little or no harm to the tissues. The effect of this antiseptic is purely local; the decomposition products are devoid of toxicity, and there is therefore no danger to be apprehended from absorption. A flow of lymph is induced from the wound as part of the reaction of the tissues. Fetor is rapidly eliminated. If pain and irritation occur they can be easily controlled by reducing the concentration of the antiseptic.

"The practical advantages of this antiseptic for field use are: (a) It can be used as a dry powder and therefore obviates the difficulty of procuring water; (b) it can be introduced into the gauze pad of the first field dressing; (c) and where water is available the same powder can be made up as a lotion for general use. The constituents of the powder are inexpensive and easily procured; and the preparation of the antiseptic is extremely simple."

Forage poisoning due to Claviceps paspali on Paspalum, H. B. BROWN and E. M. RANCK (*Mississippi Sta. Tech. Bul. 6 (1915), pp. 3–35, figs. 18*).—This report of studies of the poisonous properties of *C. paspali* includes feeding tests with guinea pigs and calves. It is shown that *C. paspali, Fusarium heterosporum*, and a species of Cladosporium grow on the heads of *Paspalum dilatatum*, the first as a parasite on the grass while the other two are largely parasites of *C. paspali.*

"*C. paspali* produces numerous sphacelial spores, by means of which the fungus is spread freely to healthy heads by insects that feed on the 'honey-dew' of the fungus. The sclerotia of *C. paspali* lie on the ground during the winter and serve to tide the fungus over from one year to the next.

"Feeding experiments with guinea pigs showed the sclerotia to be poisonous, producing characteristic nervousness and trembling; 1 gm. of the extract produced death in a few hours. The poison in the sclerotia retains its virulence for months after they have been dried; hay containing sclerotia will, apparently, poison animals as readily as the grass. Feeding young or healthy Paspalum grass or hay causes no trouble. Feeding Paspalum grass or hay infected with *C. paspali*, and showing sclerotia, or fungus nodules, will result in poisoning in cattle, and, if continued, will cause death.

"One attack of Paspalum poisoning does not produce immunity against a subsequent attack. Cattle seem to acquire a decided appetite for the diseased heads of Paspalum and even for the fungus sclerotia. Symptoms seem to indicate that the trouble is due to a cumulative poison of some kind. Animals poisoned by Paspalum should be taken from the pasture, given a regular dose of Epsom or Glauber salts, and a change of feed. Paspalum poisoning may be prevented by clipping off the diseased heads of Paspalum as often as sclerotia, or fungus nodules, appear; this may be done with mowing machine or hand scythe; one to three mowings during the summer and fall will be necessary."

A bibliography of 25 titles is appended.

Precipitins in the diagnosis of anthrax, A. ASCOLI (*Vet. Rec., 27 (1915), No. 1400, pp. 575–577, fig. 1*).—Certain bacillary constituents result from bacteriolysis in the organs or tissues from the carcasses of animals which have been affected with anthrax. Such substances would naturally be expected to exist in specimens in inverse proportion to the number of micro-organisms remaining intact. These substances can be recovered by serodiagnostic methods, which will indicate anthrax protoplasm in a pulp or blood in which they exist.

The author has found few active precipitant sera as ordinarily prepared, but has developed a method by which good precipitant sera may be regularly

obtained. Large doses of avirulent cultures are used rather than smaller doses of more virulent micro-organisms. The precipito-reaction reveals the presence of anthrax protoplasm in the extract of the organs (spleen, lungs, liver, kidneys, suprarenals, and intestine) in the blood, edematous fluid, etc. Putrefaction in no way affects the precipitin reaction, absolute positive results having been obtained by the author in material 16 months old. A thermo-precipitin method which is very rapid and delicate has been developed.

Foot-and-mouth disease with special reference to the outbreak of 1914–15, J. R. Mohler (*Jour. Amer. Vet. Med. Assoc., 48 (1915), Nos. 3, pp. 273–285; 4, pp. 402–419; 5, pp. 532–552*).—A paper presented at the annual meeting of the American Veterinary Medical Association at Oakland, Cal., September, 1915, in which the author deals with the source and history of the infection, methods of eradication, detailed measures to be adopted, and the occurrence of the disease in foreign countries, including a synopsis of the disease in Europe during the past five years in tabular form. An abstract of the discussion which followed is appended.

The mallein ophthalmic test in glanders, J. Schnürer (*Monatsh. Prakt. Tierheilk., 26 (1914), No. 3–4, pp. 97–108; abs. in Jour. Amer. Vet. Assoc., 48 (1915), No. 3, pp. 332–334*).—The methods of diagnosis and extermination of glanders are considered together with some statistical data.

It is concluded that a glanders epizootic may be eradicated by killing clinically sick horses and by diagnostic examination of horses found to be ailing. Immunization treatment is at least superfluous. The most practical method of diagnosis is considered to be one which gives reliable results in a comparatively short time, even in the hands of those not specially trained, as well as one which is simple to perform, easy to form a judgment on, which lends itself to mass examination, and which at the same time is comparatively cheap. The serological methods (agglutination, complement fixation, precipitation, conglutination, and Abderhalden and anaphylaxis reactions) do not fulfill these requirements, either alone or in combination. The conditions, however, are met by the mallein ophthalmic test, which is performed by applying a reliable concentrated mallein with a brush, cotton pledget, glass rod, or some similar appliance, but not by dropping with either a pipette or dropping bottle. The conjunctival test does not interfere with the agglutination reaction. Should the serological reaction fail to lead to a rapid decision the classical subcutaneous reaction with a standardized mallein is recommended.

The diagnostic failures with the mallein ophthalmic test and the subcutaneous reaction of healthy horses are attributed, to a great extent, to a hypersensitiveness toward mallein, due to an existing glanders infection. In such cases the body temperature should be considered before and several days after the inoculation.

It is not deemed justifiable to kill horses which have reacted positively in only the mallein test or to the agglutination reaction, and which otherwise exhibit no clinical disturbances. Such horses are, in all probability, not infected.

The recognition of healthy horses which have received a subcutaneous injection of mallein, Kranich (*Ztschr. Veterinärk., 27 (1915), No. 12, pp. 353–358*).—It is considered difficult to recognize, by any simple and satisfactory method, healthy animals which have received a subcutaneous injection of mallein. The matter is simplified for the veterinarian, however, by determining the district from which the animal came, by obtaining a fall in the complement reaction, and by securing repeated negative ophthalmic tests.

A bacteriological study of tuberculosis of the lymph glands in children, A. P. Mitchell (*Edinb. Med. Jour., n. ser., 13 (1914), No. 3, pp. 209–215; abs. in*

Internat. Centbl. Gesam. Tuberkulose Forsch., 9 (1915), No. 4, p. 187; Jour. Amer. Vet. Med. Assoc., 48 (1915), No. 3, pp. 328, 329).—The author examined the cervical, bronchial and mesenteric glands, and occasionally the tonsils, in 29 cases of tuberculosis in children, all under 12 years of age. Cultures were isolated from 12 of the cases, 8 yielding human tubercle bacilli, and 4 the bovine type. Three of the latter 4 died of tubercular meningitis, the other from intraperitoneal hemorrhage. Tubercular lesions were found in the mesenteric glands of all the cases at the autopsy. In the cases yielding the human type of tubercle bacilli the cultures were derived mainly from the cervical, bronchial, and mesenteric glands.

In 80 surgical tubercular cases of children, 12 years of age and under, the bovine bacillus was present in 71 instances and the human bacillus in 9. The organisms were isolated from the cervical glands. It is noted that 84 per cent of the children 2 years old and under had been fed unsterilized cow's milk since birth. The results of an examination of 406 samples of milk collected from the city of Edinburgh showed 82 to contain tubercle bacilli.

A fatal case of tuberculosis of bovine origin, H. Beitzke (*Berlin. Klin. Wchnschr., 51 (1914), No. 33, pp. 1537–1540; abs. in Jour. Amer. Vet. Med. Assoc., 48 (1915), No. 3, p. 331*).—The author describes a fatal case of tuberculosis in a 14-year-old boy. All attempts to cultivate the isolated bacillus on artificial media failed, but by inoculation of rabbits and cattle the organism causing the boy's death was proved to be of the bovine type. It is concluded that the bovine bacillus must be considered a real source of infection for man.

Tuberculosis in a horse (*Ztschr. Veterinärk., 27 (1915), No. 12, pp. 362, 363*).—The autopsical findings of a case of tuberculosis in a horse which had been used in the artillery service are reported.

One instance of the occurrence of tuberculosis among Wyoming cattle and its significance, O. L. Prien (*Wyoming Sta. Rpt. 1915, pp. 124–126*).—A case is reported to show the rapidity with which tuberculosis is spread among farm animals. The importation of a small herd of dairy cattle which had been tested and "absolutely guarantied against tuberculosis" was followed by the death of 3 calves from the cows imported, 7 head of hogs, and 26 chickens. Six of the cows and 3 of the calves of the imported herd were condemned after being tested. The author indicates the need for great caution in the purchase of cattle.

The production of artificial immunity against tuberculosis in cattle, S. H. Gilliland (*Penn. Live Stock Sanit. Bd. Circ. 32 (1915), pp. 129, pls. 9*).—As a result of the work of the State Live Stock Board of Pennsylvania, covering a period of a number of years, the author concludes that "intravenous injections of tubercle bacilli from human sources, nonvirulent for cattle, are capable of conferring an immunity in cattle against tuberculosis sufficient to withstand natural infection by association with tuberculous cows. The length of the immunity conferred has not been determined definitely, but it is believed to diminish gradually after two and one-half years.

"The vaccinated animal during the period of vaccination and for some weeks afterward is more liable to contract tuberculosis than a normal animal. The natural resistance of the animal is apparently lowered during the time of vaccination. The interval between the vaccination should be of a sufficient length to allow any reaction following the previous vaccination to subside entirely.

"The degree of immunity obtained in the animal depends to a certain extent upon the number of vaccinations and the amount of vaccine administered. The vaccine should be prepared so it contains no clumps of bacilli and should be administered fresh.

"A number of the vaccinated animals may give a typical tuberculin reaction following the vaccinations for a period of 20 months. These animals may or may not show lesions of tuberculosis at autopsy. Vaccine administered to animals already infected with tuberculosis is capable of retarding or holding in check the progress of the disease.

"The milk from immunized cows when fed over a long period of time appears to increase the resistance of calves and pigs. Vaccination of calves against tuberculosis is of assistance in the eradication of tuberculosis from a herd if done under the proper conditions. Until further knowledge is obtained in regard to the destruction or outcome of the living tubercle bacilli constituting the vaccine, no practical method for the immunization of milk-producing animals under ordinary conditions can be advocated."

Part 2 reviews the work on the production of immunity in cattle against tuberculosis and the use of tuberculin. A complete bibliography of literature cited in the review of the subject is appended.

Agglutination test as a means of studying the presence of Bacterium abortus in milk, L. H. COOLEDGE (*U. S. Dept. Agr., Jour. Agr. Research, 5 (1916), No. 19, pp. 871–875*).—As a result of an investigation at the Michigan Experiment Station, the author concludes that "a pure culture of *B. abortus* introduced into the milk cistern of a cow's udder caused the appearance of agglutinins in the milk. In every case in which *B. abortus* was found present in the milk by animal inoculation the agglutinins for this organism were also found, but this bacterium was not found in every case in which agglutinins were demonstrated. The agglutination test is of value in studying the presence of *B. abortus* in milk when it is desired to study a large number of samples. If *B. abortus* is found to be pathogenic for human, this test may be of value as another means of safeguarding certified and all unpasteurized milk."

See also a previous note (E. S. R., 33, p. 774).

The bactericidal action of methylene blue on abortion bacilli, F. B. HADLEY (*Vet. Alumni Quart. [Ohio State Univ.], 2 (1915), No. 4, pp. 139–142*).—In this paper the author reports the results of tests made of two different makes of methylene blue.

Three strains of the abortion bacillus were used in the experiments, conducted in the veterinary laboratory at the University of Wisconsin, all of which were satisfactorily cultivated after exposure to solutions of Merck's medicinal methylene blue varying in strength from 1:1,000 to 1:4,000 for 73 hours. One particularly resistant strain was able to reproduce itself after having been immersed in a 1:4,000 solution for 124 hours. Grübler's blue appeared to be more toxic for the organisms. Accompanying tables record the bactericidal effect of the chemical manufactured by the two different firms.

These experiments indicate that under laboratory conditions methylene blue does not destroy the abortion bacilli readily even in strong solutions, and should not be considered a "sure cure" for the disease which they cause. It is considered to be of little value as an external antiseptic.

Brief history of the cattle tick fight in Louisiana to date, W. H. DALRYMPLE (*La. Live Stock Sanit. Bd. Circ. 6 (1915), pp. 16*).—This circular reviews the history of the cattle tick control work carried on in Louisiana up to the present time.

Cell inclusions in hog cholera, L. R. HIMMELBERGER (*Jour. Amer. Vet. Med. Assoc., 48 (1916), No. 4, pp. 450–453, fig. 1*).—The author has systematically examined smears from the conjunctival epithelium of a number of hogs and has observed cell inclusions under various circumstances. He has never found the inclusions in the epithelial cells after death and all cells did not contain them even in a positive case, having, in fact, been found in but a small percentage of

the cells in a given microscopical field. These bodies were found in 95 per cent of the cases examined during the period in which the body temperature was beginning to rise, that is, in the first stages of the disease. In but a small percentage of the cases were cell inclusions observed at the time the temperature was at its maximum (106 to 108° F.). Examination of sections taken from a few cases at the time of death failed to show the presence of cell inclusions, and smears made from the conjunctiva of hogs after death gave similar results. The actual significance of these bodies remains to be determined.

A filterable organism isolated from the tissues of cholera hogs, D. J. Healy and E. J. Gott (*Jour. Infect. Diseases, 18 (1916), No. 1, pp. 124–128, pl. 1*).—Continuing the work on hog cholera at the Kentucky Experiment Station, previously noted (E. S. R., 34, p. 582), the authors report that they have isolated an organism from the mesenteric glands of hogs acutely ill with hog cholera. The organism has been passed through an "F" Chamberland-Pasteur bougie and successfully cultivated and stained. Complement fixation has been obtained with the culture fluid in which the organism was grown. This fluid was not able to fix complement previous to the growth of the organism in it.

The value of virulent salt solution in the production of antihog-cholera serum by the intravenous method, R. Graham and L. R. Himmelberger (*Jour. Infect. Diseases, 18 (1916), No. 1, pp. 118–123*).—In experimental work at the Kentucky Experiment Station the use of salt virus in conjunction with blood virus for the production of antihog-cholera serum has given satisfactory results. In the work 25 cc. per pound of body weight of a 0.9 per cent sterile salt solution was injected into the peritoneal cavity of virus pigs five hours before killing, when the solution was aseptically removed. In laboratories where all serum is tested before being used in the field this method has proved a perfectly safe and economical procedure.

Suggestions relative to the prevention of hog cholera, J. H. Kastle, R. Graham, and H. K. Wright (*Kentucky Sta. Circ. 10 (1915) pp. 70–80, figs. 4*).—This bulletin contains practical suggestions relative to the general care and management of hogs; precautions to be observed in purchasing new stock; the disposition of hog-cholera carcasses and proper disinfection; the sale and transportation of sick hogs; the prevention of hog cholera by means of hog-cholera serum; the construction of hog houses; the control of internal parasites; and the use of some hog remedies.

Effects of refrigeration upon the larvæ of Trichinella spiralis, B. H. Ransom (*U. S. Dept. Agr., Jour. Agr. Research, 5 (1916), No. 18, pp. 819–854*).—This is a report of investigations conducted in continuation of those previously noted (E. S. R., 30, p. 881).

During the course of the work quantities of trichinous meat varying in weight from a few grams to nearly 400 lbs. were frozen and kept for periods varying from a few minutes to 57 days at various temperatures below the freezing point of water. In most cases the period of refrigeration was between 5 and 20 days. About 33,000 trichinæ were examined from artificially digested frozen and unfrozen meat and over 500 test animals and control animals were fed and examined.

"A considerable proportion of the trichinæ in meat exposed to a temperature of about 15° F. for periods of 23 days or less survive and are quite lively after thawing, but such meat frequently fails to infect test animals. This temperature is injurious to trichinæ, but its effects are uncertain, and meat exposed as long as 23 days has proved to be infectious. Some of the trichinæ in meat exposed to a temperature of about 10° for periods of 57 days or less generally survive, but the meat frequently fails to infect test animals. A temperature of 10°

is more injurious to trichinæ than a temperature of 15°, but, like the latter, its effects are uncertain, although meat exposed to it for 14 days or longer has generally failed to produce infestation, or if infestation resulted it was slight. No infestation has been produced by trichinous meat exposed to a temperature of about 10° for 20 days or longer.

"Apparently in the neighborhood of 10° a critical point is reached below which the effects of cold upon trichinæ become suddenly much more pronounced. Temperatures of 5° or lower profoundly affect the vitality of trichinæ. Only a very small proportion survive an exposure of more than five days, and these are so seriously affected that infections are very unlikely to result. Slight infections, however, have resulted from meat exposed to a temperature of −9 to 0° for 10 days. . . .

"Trichinæ vary in their resistance to cold, and some individuals survive refrigeration longer and at lower temperatures than others. . . . The vitality of trichinæ which survive refrigeration does not decrease noticeably during a period of at least a week after the thawing of the meat. . . .

"In the practical application of refrigeration as a means of destroying the vitality of trichinæ, meat should be refrigerated at a temperature not higher than 5° for not less than 20 days, a period which allows a probable margin of safety of nearly 10 days. The employment of higher temperatures of refrigeration as a means of destroying the vitality of trichinæ is not justified in the light of our present knowledge because of the uncertainty of the effects of such temperatures. Whether temperatures higher than 5° may be safely employed by lengthening the period of refrigeration remains to be determined."

A disease resembling "forage poisoning" in horses and mules, wherein oat hay incorporated the primary factor, R. Graham, L. R. Himmelberger, and R. L. Pontius (*Jour. Amer. Vet. Med. Assoc., 48 (1916), No. 5, pp. 574–590, fig. 1*).—A detailed account of investigations substantially noted from another source (E. S. R., 33, p. 880).

"The oat hay responsible for this disease, though apparently clean, was later found to be contaminated with the excreta of chickens, which on being fed disguised in wholesome feed resulted fatally. Up to this time, however, we have not been able to isolate the causative factor of the disease occurring as a result of feeding this particular lot of oat hay, nor have we been able to show that oat hay from other sources produces 'forage poisoning' in horses and mules."

The present knowledge of the cause of pectoral influenza of the horse, E. Graüb (*Schweiz. Archiv Tierheilk., 57 (1915), Nos. 8, pp. 392–402; 9, pp. 449–457*).—A review of the literature.

Pernicious anemia of the horse, E. Wyssmann (*Schweiz. Arch. Tierheilk., 57 (1915), No. 9, pp. 427–449; abs. in Trop. Vet. Bul., 3 (1915), No. 4, pp. 149, 150*).—In the introduction the author reviews the literature relating to this disease, and calls attention to the theory of causation as set forth by the Seyderhelms in the work previously noted (E. S. R., 33, p. 681).

The author has observed 125 cases of anemia in horses, of which 44 were of a pernicious character, and the remaining cases a secondary condition. He found that in 50 per cent of the cases the animals were under seven years of age. In acute cases the hemoglobin content of the blood was from 30 to 55 per cent of the normal, whereas in cases of longer standing it was as low as 15 per cent. In his opinion the prognosis is not so unfavorable as many observers consider it. Of his 44 cases, 25 died, 5 improved, 11 were cured, and 3 were lost sight of. He thinks there is a chance for improvement while the hemoglobin content does not fall below 40 to 55 per cent of the normal. The subcutaneous injection of a 10 per cent watery solution of atoxyl is recommended,

although in advanced cases accompanied by edema this drug does not give good results. In acute cases at least one dose a week of from 10 to 20 cc. should be given.

"Black tongue" or typhus of dogs, J. M. KERR (*Vet. Alumni Quart.* [*Ohio State Univ.*], *2* (*1915*), *No. 4, pp. 154, 155*).—The author calls attention to the fact that this disease of dogs, known to be extremely common in the Southern States and as far north as Virginia, resembles the disease described by Hutyra and Marek as typhus (E. S. R., 26, p. 82).

Complement fixation in intestinal parasitism of dogs, J. A. KOLMER, MARY E. TRIST, and G. D. HEIST (*Jour. Infect. Diseases, 18* (*1916*), *No. 1, pp. 88–105*).—From the results of a study of complement fixation tests with the sera of infested dogs the authors believe that the production of antibodies may occur after infestation of the intestines with the common parasites.

"Production of antibodies was especially in evidence in infestations with tapeworms, to a less degree with the ascarids or round worms, and to a slight extent with the whip-worm. These complement fixations have tended to show a biologic relation between the tapeworms *Tænia serrata* and *Dipylidium caninum* and between *Ascaris canis* and *Strongylus gigas*, although on account of the wide morphologic differences we leave it an open question. It is probable, therefore, that complement-fixation tests will not differentiate, with the usual technique, between related species of parasites, although they may show the presence of a parasite.

"Complement-fixation tests may be of value in the diagnosis of intestinal parasitism of man, and we are now making investigations in this field."

Some experiments with agents calculated to kill the Trombidium holosericeum, B. F. KAUPP (*Science, n. ser., 43* (*1916*), *No. 1097, pp. 33–35*).—Tests made of the effect of a number of parasiticides upon the chicken mite have led to the conclusion that in order to destroy this mite effectively they must either be in solution or be capable of giving off volatile substances which in themselves are destructive.

RURAL ENGINEERING.

Some notable irrigation and hydro-electric developments, C. E. GRUNSKY (In *Nature and Science on the Pacific Coast. San Francisco: Paul Elder & Co., 1915, pp. 228–236*).—This article describes briefly some of the more important Government and private irrigation and hydro-electric developments in California and gives a bibliography of related works.

State rivers and water supply commission, tenth annual report, 1914–15 (*Victoria Rivers and Water Supply Com. Ann. Rpt., 10* (*1914–15*), *pp. 41, figs. 2*).—The physical and financial conditions of water supply and irrigation works in Victoria for the financial year 1914–15 are reported.

The Dethridge meter, V. M. CONE (*Colorado Sta. Bul. 215* (*1915*), *pp. 11, figs. 7*).—The results of experiments on 4-ft., 5-ft., and 6-ft. Dethridge meters, conducted under a cooperative agreement between the Office of Public Roads and Rural Engineering of this Department and the Colorado Experiment Station, are graphically reported, the curves showing the approximate loss of head necessary to allow different quantities of water to flow through the meter, the quantities of water passing through the meter with the wheel revolving at different speeds, and the acre-inches of water delivered per revolution of the wheel with different depths of water in the ditch.

The construction and operation of the meter are described and diagrammatically illustrated. A previous report dealing in part with the Dethridge meter has been noted (E. S. R., 32, p. 683).

A note on well boring, W. M. Schutte (*Dept. Agr. Bombay Bul. 68 (1914), pp. 13, pls. 12*).—This bulletin describes methods and machinery for well boring and methods for lifting water, considered to be applicable to Bombay conditions.

Surface water supply of Colorado River basin, 1913 (*U. S. Geol. Survey, Water-Supply Paper 359 (1916), pp. 260, pls. 2*).—This report, prepared in cooperation with the States of Arizona, Utah, and New Mexico, presents the results of measurements of flow made on streams in the Colorado River basin during 1913.

Surface water supply of Hudson Bay and upper Mississippi River basins, 1914 (*U. S. Geol. Survey, Water-Supply Paper 385 (1915), pp. 247+XXIX, pls. 2*).—This report, prepared in cooperation with the States of Iowa, Illinois, Wisconsin, and Minnesota, presents the results of measurements of flow made on streams in the Hudson Bay and upper Mississippi River drainage basins during 1914.

Ground water in the Waterbury area, Connecticut, A. J. Ellis (*U. S. Geol. Survey, Water-Supply Paper 397 (1916), pp. 73, pls. 4, figs. 10*).—This report deals with the geology, source, and occurrence of ground water and ground waters for municipal and private use in an area of 171 square miles in west-central Connecticut. Methods of developing ground water supplies for private use in particular are discussed, including drilled, driven, and dug wells, and infiltration galleries.

Analyses of mineral and potable waters, A. M. Peter, S. D. Averitt, and J. S. McHargue (*Kentucky Sta. Rpt. 1912, pp. 527–550*).—Analyses of 55 samples of potable and mineral waters from 34 counties in Kentucky are reported.

Analyses of mineral and potable waters, A. M. Peter, S. D. Averitt, J. S. McHargue, and A. S. Behrman (*Kentucky Sta. Rpt. 1913, pp. 593–618*).—Analysis of 68 samples of potable and mineral waters from 33 counties in Kentucky are reported.

Analyses of mineral and potable waters, A. M. Peter, S. D. Averitt, and J. S. McHargue (*Kentucky Sta. Rpt. 1914, pt. 1, pp. 85–118*).—Analyses of 92 samples of potable and mineral waters from 42 counties in Kentucky are reported.

Water supplies and health in Massachusetts, A. L. Gammage (*Engin. News, 74 (1915), No. 23, pp. 1077–1079*).—Studies of hardness and color and the corresponding typhoid fever and general death rates indicate that the hardness of the water has no effect upon health, but that color is to some extent an index of the healthfulness of supplies.

The Schumann rays as an agent for the sterilization of liquids, W. T. Bovie (*Bot. Gaz., 60 (1915), No. 2, pp. 144–148, fig. 1*).—Tests are described as carried out on water passed through an improved sterilizer, in which a long exposure of a thin layer of the liquid to light of wave lengths between 1,675 and 1,850 Ångström units was secured. By this treatment the bacterial count of tap water was reduced from 50 to 4 per cubic centimeter and the fungal count from 3 to 1 per cubic centimeter, but absolute sterilization was not obtained.

A list of references to literature bearing on the subject is appended.

First annual report of the Iowa state highway commission (*Ann. Rpt. Iowa Highway Com., 1 (1913–14), pp. 351, pls. 32, fig. 1*).—This report covers the periods from April to December, 1913, and from December, 1913, to December, 1914. In addition to the departmental reports are sections devoted to road legislation, the most important phases of highway work, investigations and research, finances, and the requirements of roads through and adjacent to state

institutions. A final section contains information summarized and tabulated from the reports of county engineers.

First annual report of the highway engineer for the period ended November 30, 1914, H. L. Bowlby (*Ann. Rpt. Highway Engin. Oreg., 1 (1914), pp. 241, pls. 44, figs. 54*).—Data, by counties, on road and bridge finances, design, construction, and maintenance in Oregon for 1914 are reported, together with miscellaneous tests of road materials.

Road laws of West Virginia, 1913, A. D. Williams (*W. Va. Dept. Agr. [Bul. 1] (1913), pp. 103*).—The text of the laws is given.

Prison labor: Instructions, laws, and duties of officials, A. D. Williams (*W. Va. Dept. Agr. Bul. 4 (1914), pp. 30, figs. 39*).—Instructions, laws, and duties of officials with reference to the employment of prison labor on road work are outlined.

The road drag, its construction and use, A. D. Williams (*W. Va. Dept. Agr. Bul. 3 (1914), pp. 29, figs. 26*).—This describes and illustrates the construction of split log, steel, and plank road drags and gives brief instructions as to their proper use.

Earth and sand-clay roads, A. D. Williams (*W. Va. Dept. Agr. Bul. 5 (1914), pp. 47, figs. 50*).—This bulletin deals with methods and machinery for the construction of earth and sand-clay roads.

Relation between the properties of hardness and toughness of road-building rock, P. Hubbard and F. H. Jackson, Jr. (*U. S. Dept. Agr., Jour. Agr. Research, 5 (1916), No. 19, pp. 903–907, fig. 1*).—Hardness, toughness, and binding power tests of about 3,000 samples representing every known variety of road-building rock are graphically reported bringing out the following points:

"(1) The average toughness for all tests made is about 9. (2) The average hardness increases with toughness, and the rate of increase becomes less as the toughness values become larger. (3) Individual values of hardness vary through wide limits for low values of toughness, and the variations from the average decrease uniformly with the increase in toughness up to a certain point, about 20, after which they remain constant with very little variation from the average. (4) When any given value for toughness falls within certain limits, which define the suitability of the material for macadam-road construction under different traffic conditions, the corresponding value for hardness will fall within similar limits for hardness. . . .

"If it be assumed that the curve represents a fair average of all available types of road-building rock, it would seem that a determination of the toughness of any particular sample of rock shows, for all practical purposes at least, whether it is hard enough to be satisfactorily used in construction. . . . The results of 2,500 individual routine tests made by the Office of Public Roads and Rural Engineering show that for practical routine work the hardness test adds nothing to our knowledge of the value of any particular rock sample for use in water-bound macadam-road construction over that obtained from the toughness test."

The proper limits of toughness for light, moderate, and heavy traffic on macadam and bituminous roads are discussed.

The development of refined tars for use in road construction and maintenance, P. P. Sharples (*Metallurg. and Chem. Engin., 13 (1915), No. 15, pp. 918–920*).—Specifications are given for (1) binders used in the construction of macadam roads, (2) refined tars for use in road-blanket treatments, (3) refined tars used in cold-surface treatments, and (4) pitches used as filler in block pavements.

Information for bidders: Specifications, proposal, contract, and bond for grading and road improvement, A. D. WILLIAMS (*W. Va. Dept. Agr. Bul. 12 (1914), pp. 44*).

Information for bidders: Specifications, proposal, contract, and bond for macadam road improvements, A. D. WILLIAMS (*W. Va. Dept. Agr. Bul. 13 (1914), pp. 66*).

Information for bidders: Specifications, proposal, contract, and bond for brick road improvement, A. D. WILLIAMS (*W. Va. Dept. Agr. Bul. 15 (1914), pp. 56, fig. 1*).

Standard specifications for superstructures of steel highway bridges, R. P. DAVIS (*W. Va. Dept. Agr. Bul. 8 (1914), pp. 29, figs. 2*).—This bulletin contains a form of contract and specification.

Standard specifications: Proposal, contract, and bond for superstructure of concrete highway bridges, R. P. DAVIS (*W. Va. Dept. Agr. Bul. 9 (1914), pp. 20, figs. 2*).—A form of tender, contract, and bond, and specifications for the superstructure of concrete highway bridges are given.

National Association of Cement Users: Proceedings of the eighth annual convention, 1912, edited by E. E. KRAUSS (*Proc. Nat. Assoc. Cement Users, 8 (1912), pp. 819, pls. 6, figs. 293*).—Among other reports and special articles are the following:

The Design of Concrete Flat Slabs, by F. J. Trelease; The Practical Design of Reinforced Concrete Flat Slabs, by S. E. Thompson; The Design of Concrete Grain Elevators, by E. L. Heidenreich; Aggregates for Concrete, by W. M. Kinney; Comparative Tests of the Strength of Concrete in the Laboratory and in the Field, by R. J. Wig; Flat Slab Concrete Bridges, by W. H. Finley; Concrete Highway Bridges, by W. S. Gearhart; Standard Specifications for Concrete Roads and Street Pavements; Recommended Practice for Plain Concrete Drain Tile; Method of Testing Drain Tile, by A. N. Talbot and D. A. Abrams; The Manufacture and Use of Cement Drain Tile, by C. E. Sims; Concrete Fence Posts, by W. J. Towne; and Concrete Fence Posts, by L. J. Hotchkiss.

Effect of controllable variables upon the penetration test for asphalts and asphalt cements, P. HUBBARD and F. P. PRITCHARD (*U. S. Dept. Agr., Jour. Agr. Research, 5 (1916), No. 17, pp. 805–818*).—Experiments with four types of oil asphalt, produced from (1) steam-refined Calfornia petroleum, (2) steam-refined Mexican petroleum, (3) refined blended petroleum, and (4) blown petroleum, are reported. The purpose was to determine what effect apparently slight differences in laboratory conditions and variations in (1) the method of preparing melted samples for testing, (2) temperature, (3) load, and (4) time will produce in the results of the penetration test for asphalts and asphalt cements. The more important conclusions reached as a result of these investigations are as follows:

"Melted samples should be cooled for not less than 2 hours prior to test, and should be tested upon the same day that they are melted, preferably after 2 or 3 hours. Samples should be maintained at the testing temperature for not less than 1 hour, and preferably for 1.5 hours prior to test.

"Upon standing in the air, prepared samples show a decreasing penetration, but no definite end point or set is produced up to 28 days. In ordinary laboratory work there is no apparent advantage in cooling samples in ice or ice water prior to determining their penetration at higher temperatures. . . . Samples should be maintained and tested within 0.1° C. of the desired temperature for accurate work, as a variation in temperature of less than 0.5° may produce a decided difference in results. Tests at 4° are not the practical equivalent of properly made tests at 0°. When making tests at 0°, samples should not be packed in crushed ice, but should be immersed in a brine bath.

"The increase in penetration of a material determined under given conditions of temperature and time is, within certain limits, almost proportional to the increase in load. For the 100- and 200-gm. loads variations of as much as 1 gm. do not as a rule seriously affect determinations. It is, however, recommended that in all cases the load should not vary more than 0.2 gm. from that desired.

"In any test, proportionally the greatest number of points penetration is obtained during the first second. In the 5-second test approximately one-half of the total penetration is obtained during the first second. A variation of one-half second may, however, produce an appreciable variation in results. A carefully calibrated metronome is recommended for securing the proper time control.

"Aside from possible variations in needles, it is believed that variations in results obtained upon the same material by different laboratories are more probably due to unobserved variations in the methods of preparing the sample and to the control of temperature than to any other causes. It is believed that a study of the penetration of various types and grades of bituminous materials under a variety of conditions of temperature, load, and time may throw considerable light upon their other physical and chemical characteristics, and may serve as a possible means of identifying their origin and method of manufacture."

The authors propose to continue studies along this line.

A study of West Virginia sands, B. Taylor, R. P. Davis, and A. D. Williams (*W. Va. Dept. Agr. Bul. 7 (1914), pp. 32, figs. 15*).—This bulletin describes the methods and results of a number of briquette and other tests of West Virginia sands which are representative of the river bank and crusher sands of the State. Most of the sands were composed chiefly of quartz and most of the other sands contained a large percentage of cinders.

"In these tests the bond of the cement was the weaker element with the quartz grains not failing even in the 28-day tests, but the grains in the soft material broke in the 7-day test." The cinders weakened the mortar. "The coarser sands rank far superior in strength. . . . The series of tests indicate the truth of the general law that a gradation of coarse and fine elements is productive of the greatest strength, other things being equal. Where strength is of greatest importance, the sieve analysis curve is of considerable value in selecting the sand. . . .

"From these experiments it appears that sharp sands show a greater increase in strength than do the others. For instance, crusher sands which have sharp grains improved in rank from 7- to 28-day tests, while all the other sands have a lower rank in the 28-day test than in the 7-day one. The strength of the mortar does not bear constant relation to the proportion of cement. Hence, the importance of testing out sands."

Electricity in agriculture, C. J. Rohrer (*Gen. Elect. Rev., 18 (1915), No. 6, pp. 483–496, figs. 21; Sci. Amer. Sup., 80 (1915), Nos. 2077, pp. 264–266, figs. 7; 2078, pp. 278, 279*).—This is a discussion of the application of electrical power to various farm operations. See also a previous and more detailed report by the author (E. S. R., 32, p. 885).

Economical construction of rural lines, A. S. Hall (*Jour. Electricity, 35 (1915), No. 23, pp. 430–432, figs. 3*).—After pointing out the desirability of a rural load for central stations and describing some important applications of electricity to farming, suggestions are made for methods of construction which it is believed will make it economically possible to give rural service.

Mechanical plowing in Risaia, A. Tarchetti (*L'Aratura Meccanica in Risaia. Vercelli: Gallardi & Ugo, 1914, pp. 162, figs. 96*).—This presents in com-

plete form experiments on mechanical plowing noted previously from another source (E. S. R., 33, p. 190).

Housing farm implements, B. YOUNGBLOOD and W. W. WHIPKEY (*Texas Sta. Circ. 10, n. ser. (1915), pp. 3–8, figs. 2*).—Plans, specifications, and bills of materials for what is considered the most convenient type of implement shed for Texas conditions are given.

The shed is long and relatively shallow, with one side left open. "On a small farm the depth may be reduced from 20 to 18 ft. and the length made just sufficient to cover the implements kept on the farm. For permanency, a continuous foundation of concrete on three sides is desirable, especially if the shed is to be constructed on a hillside. The shed can be constructed, however, at considerably less expense if concrete piers are used instead of the continuous foundation."

Pressure of cotton seed, W. M. ELIOT (*Engin. News, 74 (1915), No. 21, pp. 991, 992, fig. 1*).—The results of tests to determine the horizontal pressure of cotton seed in warehouse bins are graphically reported, the equation of the curve being $P=\frac{5}{2}H$, in which P=the horizontal pressure in pounds per square inch and H=the head in feet. The weight of the loose seed was taken at 22.4 lbs. per cubic foot and of the packed seed as 33.6 lbs. per cubic foot, and the angle of repose of the seed as 38° 40′.

The purification of municipal sewage in Germany by natural biological processes, J. KÖNIG and H. LACOUR (*Landw. Jahrb., 47 (1914), No. 4, pp. 477–572, figs. 6*).—This is a report of an extended study of methods employed in Germany for the purification and disposal of municipal sewage. It contains a large amount of statistical and other data of a technical nature covering the amount, general character, and composition of municipal sewage, and the efficiency and economy of the so-called natural biological processes of purification. These consist of irrigation, spraying, fish ponds, and intermittent soil filtration.

The most space is devoted to a presentation of the results of experience in sewage irrigation. This method of sewage disposal, it is thought, presents great agricultural possibilities from the German standpoint, not only as a means of reclamation by irrigation of more or less barren farm lands in the immediate vicinity of cities, but as an economical means of supplying valuable nutritive constituents to the soil. It also constitutes one of the main factors in improving the physical conditions of soil. It is pointed out, however, that proper cultural treatment, including liming, must accompany sewage irrigation in order to realize the best results.

Owing to its cheapness and efficiency in sewage purification, sewage irrigation is considered to be the best method of those investigated for the efficient and economical purification and disposal of municipal sewage for German cities to employ.

Researches into the purification of dairy sewage, WEIGMANN and A. WOLFF (*Milchw. Zentbl., 44 (1915), Nos. 4, pp. 49–60; 5, pp. 65–73; abs. in Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases, 6 (1915), No. 6, pp. 876, 877; Gsndhts. Ingen., 38 (1915), No. 28, p. 332*).—Experiments on different methods of treating dairy sewage showed that purification by biological action on contact filter beds was very good so far as the removal of substances liable to putrefaction was concerned, since about 70 per cent of the albuminous substances and 85 per cent of the easily oxidized matters were removed. Purification, however, was not complete, since the sewage still retained a strong smell of putrefaction and required subsequent aeration. For this purpose spraying into the air, followed by sand filtration, is recommended.

"Purifying by irrigation can not equal this method in completeness. Clarifying with limewater is insufficient and such a preliminary purifying in no wise increases the efficacy of biological action. Equally insufficient is the purification of waste water by means of colloidal clay and limewater, and a preliminary treatment with these substances is useless. These methods are scarcely as good as the lime-purifying process, and have the disadvantage of not leaving the water clear. Colloidal clay must therefore be omitted from the substances that can be used for the purification or clarification of waste water.

"A considerable clarifying effect must, however, be attributed to ferric sulphate, and its use should be especially efficacious in the case of waste dairy water, for this contains its albuminous matter in a colloidal condition. In the experiments, 65 per cent of the total albumin was decomposed. Used in the preliminary treatment, ferric sulphate increases very considerably the biological purification. The use of this compound is therefore to be recommended where bacterial action alone proves to be insufficient."

The agricultural value of the sludge is considered questionable.

A summary of the experience gained in the treatment of the wastes from the scouring of wool, H. R. Crohurst and A. D. Weston (*Engin. and Contract.*, *44* (*1915*), *No. 19, pp. 370–376*).—Analyses of wool scouring liquors show that they are a concentrated brownish liquor containing large quantities of organic matter in solution and suspension, soap and alkali, and waste containing potash and grease.

It was found by experiment that ordinary sewage treatment methods could not be applied effectively from the standpoint of purification, or economically from the standpoint of recovery of the grease and potash. Experiments with a number of special methods are described, and it is concluded that "the best method seems to be the separation of the concentrated liquor, the recovery of both potash and grease or the grease alone, and the purification of the dilute liquors together with the remaining liquors, after the recovery process by sewage purification methods. . . .

"By the Smith-Leach process the wool scouring liquor can be entirely destroyed, the resulting products being grease, potash, distilled water, sand, and mud. No liquid remains to be treated by sewage methods. From such data as are available this method of disposal will yield a fair return upon the cost of the plant and cost of operation, and there remains no liquid of a polluting nature to cause nuisance."

RURAL ECONOMICS.

Safe farming, B. Knapp (*U. S. Dept. Agr., Office Sec. Circ. 56* (*1916*), *pp. 16*).—The author in this address, delivered before the second annual conference of Cotton States Bankers, defines safe farming as living from the products of the farm and from the sale or exchange of the sundry products other than the main money crop, and then the production of money crops for the market. He recommends that this organization undertake the following work:

Conduct a campaign of education of merchants and bankers to get the basis of credit changed to the new safe farming basis. Secure, if possible, the adoption of some sort of rate sheet or schedule for farm loans, which discloses the plan of farm operation. Take up in every county and market town the establishing of some system by which the farmers may be able to market, at fair prices, every product of the farm, with arrangements for assembling, standardizing, packing, handling, and shipping in case the local community is oversupplied. Work with the agricultural forces of each State in planning and assist-

ing them in carrying out such special campaigns as may be deemed necessary further to impress the necessity of safe farming upon farmers and country people generally.

Continue to give cordial support and backing to the county agents, both men and women, the extension forces of the States, and all educational activities of a public character, as they are the permanent forces in the State and working in the interests of all the people.

Community welfare in Kansas, W. Burr (*Kans. Agr. Col. Ext. Bul. 4 (1915), pp. 34, figs. 21*).—The author has discussed the factors in community activity and outlined certain different lines of work that can be taken up in each. He gives a suggested constitution for a community welfare club and the available bulletin material on community welfare projects. As pointed out by the author, he has adapted the plans outlined by Carver previously noted (E. S. R., 33, p. 292) to certain typical Kansas conditions.

Hale's history of agriculture by dates, P. H. Hale (*St. Louis, Mo.: Hale Publishing Co., 1915, 5. ed., pp. 94, figs. 122*).—This pamphlet contains a large number of historical references to agricultural events dating from 4241 B. C. to date.

The holy earth, L. H. Bailey (*New York: Charles Scribner's Sons, 1915, pp. VI+171*).—In this book are discussed the relationship of man to the earth, especially the various aspects which affect the life of agricultural people.

German agriculture and the war (*Jour. Bd. Agr.* [*London*], *22* (*1915*), *No. 8, pp. 741–750*).—This article contains a brief description, drawn from German publications, of the methods used to husband the food supply and to feed the people as well as the live stock.

Plan for the reorganization of agriculture in Spain, G. F. de la Rosa (*Bol. Agr. Téc. y Econ., 7* (*1915*), *Nos. 73, pp. 73–82; 74, pp. 142–151; 75, pp. 237–246; 76, pp. 336–345; 77, pp. 444–454; 78, pp. 543–553; 79, pp. 643–653*).—The author gives a historical description of the agriculture of Spain from the time of the expulsion of the Carthaginians to the present, and outlines a plan for the reorganization of the existing system of production and of providing farmers with better credit facilities.

English field systems, H. L. Gray (*Cambridge, Mass.: Harvard University Press, 1915, pp. IX+568, pl. 1, figs. 16*).—The author has examined the historical evidence of the different systems of holding land in England.

He concludes that the different systems are the result of the differences in extent to which foreign nations subjugated the English people, and he points out that throughout five counties of the southeast the influence of Roman Britain in agrarian affairs persisted after the Germanic conquest of the fifth century. Either the conquerors showed extraordinary flexibility in adopting a field system with which they must have been unfamiliar, or they spared a part of the native population who, as serfs, continued to employ their own agricultural methods. The large central area, stretching from Durham to the Channel and from Cambridgeshire to Wales, was the region throughout which Germanic usage prevailed, presumably because of the thoroughgoing nature of the fifth-century subjugation; the southeast was characterized by the persistence of Roman influence; and the counties of the southwest, northwest, and north retained Celtic agragian usages.

The systems of renting land in England, Scotland, and Ireland, J. Wilson (*Hoard's Dairyman, 1915, Dec. 31, pp. 747, 751, 752*).—The author gives a brief historical statement regarding the past system of renting and points out the principal features of the system now in effect.

Investigation of the use of land in common in Bavaria, A. Weiss (*Landw. Jahrb. Bayern, 3 (1913), No. 9, pp. 381–483, pls. 8*).—This article contains data as to the history, present status, and value of the land held in common, and discusses the present practices and methods of organizing the land to produce the greatest net returns.

Agricultural labor and wages in western India, G. F. Keatinge (*Agr. Jour. India, 10 (1915), No. 3, pp. 231–236*).—The author states that the Deccan peasant has been accustomed to periods of enforced idleness and the conditions of intermittent labor, which produce a condition of apathy and helplessness which acquires the rigidity of a race characteristic. He considers it probable that the rising standard of living and the increased facilities for obtaining remunerative labor will in the future do much to correct this. His article cites instances of how this change is taking place.

Rural credits (*Fruit and Prod. Marketer, 6 (1915), No. 33, p. 13*).—This is an abstract of an address by Dr. Elwood Mead, of the University of California, delivered before the National Conference on Marketing and Farm Credits. The speaker outlined briefly the system of credit adopted in Australia and New Zealand, and suggested that it may be applicable to conditions in the Western States in preference to the systems commonly found in European countries.

Direct dealing between producer and consumer (*U. S. Senate, 64. Cong., 1. Sess., Doc. 240, pp. 39*).—This document contains a series of hearings relating to direct dealing between producers and consumers through the parcel-post service by employing mail order methods.

Cooperative societies connected with wine making in middle France, L. Mandeville (*Étude sur les Sociétés Coopératives de Vinification du Midi de la France. Thesis, Univ. Toulouse, 1914, pp. 222, pls. 2*).—The author points out the economic and technical motives that were the primary cause of establishing cooperative wine cellars. By cooperation the producers were able to obtain satisfactory credit and market their produce to a greater advantage. Supplementary data are given showing the number of societies and the extent of business and recent laws relating to cooperative agricultural organizations. A brief bibliography is appended.

Monthly crop report (*U. S. Dept. Agr., Mo. Crop. Rpt., 2 (1916), No. 1, pp. 12, figs. 3*).—In this number are given the final estimates as to the number of live stock in the United States. Compared with January 1, 1915, the following changes are indicated:

"In numbers, horses have decreased 29,000; mules increased 86,000; milch cows increased 726,000; other cattle increased 2,386,000; sheep decreased 794,000; swine increased 3,429,000. In average value per head, horses decreased \$1.73; mules increased \$1.51; milch cows decreased \$1.43; other cattle increased \$0.11; sheep increased \$0.67; swine decreased \$1.47. In total value, horses decreased \$39,634,000; mules increased \$16,553,000; milch cows increased \$8,781,000; other cattle increased \$83,759,000; sheep increased \$29,661,000; and swine decreased \$65,589,000. The total value on January 1, 1916, of all animals enumerated was \$6,002,784,000, as compared with \$5,969,253,000 on January 1, 1915, an increase of \$33,531,000, or 0.6 per cent."

It is estimated that the total production of milk in the United States in 1915 was about 11,590,000,000 gal. The average per capita production is estimated at 115 gal. varying as follows: In the North Atlantic States 71 gal., in the South Atlantic States 66 gal., in the North Central States 188 gal., in the South Central States 88 gal., and in the far Western States 131 gal. The average yields of milk per cow for the year are estimated at 584 gal., 463 gal., 560 gal., 431 gal., and 615 gal., respectively, or an average of 537 gal.

Statements are given showing the yearly marketings of live stock, imports and exports of butter and eggs, stock of potatoes on hand, disposition of the cabbage crop, and the wool production for 1915. Monthly prices are for a series of years for the different types of live stock. The estimated farm value of important products on December 15 and January 1, and the range of prices of agricultural products at important markets are also given, together with miscellaneous data.

Of the total receipts of cattle at Chicago on different days of the week, about 43 per cent is shown to have been received on Mondays, 9 per cent on Tuesdays, 34 per cent on Wednesdays, 10 per cent on Thursdays, 3 per cent on Fridays, and 1 per cent on Saturdays. Mondays' quotations averaged $8.50, Tuesdays' $8.20, Wednesdays' $8.51, Thursdays' $8.20, and Fridays' $7.87, with no market on Saturday.

Cotton facts, edited by C. GELLER (*New York: Shepperson Publishing Co., 1915, 40. ed., pp. 220, pl. 1, figs. 4*).—This book contains a compilation of the crops, receipts, exports, stocks, home and foreign consumption, visible supply, prices, and acreage of cotton in the United States and other countries for a series of years.

Annual agricultural statistics of France, 1913 (*Statis. Agr. Ann. [Paris], 1913, pp. XII+286*).—In addition to giving statistical data, showing by departments for France for 1913 the acreage, yield, and average prices of the principal farm crops and the number of live stock, there is shown for France as a whole the acreage and production for 1904 to 1913. Additional data are given relative to the manufacturing industries using agricultural products, foreign trade in agricultural products for 1911 to 1913, and the area, production, and trade in agricultural products in a number of other important countries.

Live stock statistics [in France] (*Internat. Inst. Agr. [Rome] Bul. Agr. and Com. Statis., 6 (1915), No. 12, p. 680*).—This page contains statistical data showing the number of live stock by kinds on December 31, 1914, and July 1, 1915.

Agricultural warehouses in Bavaria (*Landw. Jahrb. Bayern, 3 (1913), No. 7, pp. 269–315*).—These pages contain a report for 1911 of the 169 agricultural warehouses in Bavaria, showing the amount of grain handled, cost of buildings and equipment, business transacted, and profit and loss.

AGRICULTURAL EDUCATION.

Report on agricultural instruction act, 1913–14 (*Canada Dept. Agr. Sess. Paper 93 (1915), pp. 145, pls. 16*).—This is a detailed report of the work carried out by the Provinces of Canada with the federal appropriations provided under the Agricultural Instruction Act, including a synopsis of the act. An appendix includes brief articles on agricultural education in Manitoba, a turnip growing competition, agricultural instruction in Belgium, an educational competition for country girls, etc.

Sixth annual report of the eleven district agricultural schools of Georgia, J. S. STEWART (*Bul. Ga. State Col. Agr., No. 91 (1915), pp. 29*).—This bulletin contains an account of the fourth annual meeting of the principals of the district agricultural and mechanical schools of Georgia, held June 5, 1915, organization lists of the schools, an outline of the revised course of study recommended by the Georgia State College of Agriculture and adopted by the principals for 1915–16, a description of subject matter, a suggested daily schedule, the text of the act creating the schools, and statistical data on the value of their farm products, repairs, salaries, value of their plants, indebtedness, enrollment, cultivation of their farms, and farm equipment.

The new course is based upon the 7-year elementary school, and extends through four years with graduation with 16 units. The major part of the work is still vocational, preparing the boy for his life work on the farm, but with an academic training that will prepare for higher education institutions. There has been added to the curriculum as optional work three hours a week for the last two years of the course, to be devoted to the definite training of teachers.

Report of agriculture in the high schools of Michigan, W. H. FRENCH (*Mich. Agr. Col., Dept. Agr. Ed. Bul. 15* (*1915*), *pp. 16, figs. 16*).—This report gives a statistical summary of agricultural instruction in the high schools of Michigan; a statement concerning agriculture in the city schools, the use of land, home projects, school and home gardens, special schools of agriculture, and effects of agricultural instruction; general recommendations for the improvement of the work; and a list of the high schools and teachers giving instruction in agriculture in 1915–16.

It is shown that during the past year 40 high schools offered one unit of agricultural work in each grade, in charge of special instructors who were graduates of an agricultural college and were employed for 12 months in the year. Twenty-five other high schools have given from one-half to one year of instruction in agriculture either by the teacher of science or the superintendent of schools. The agricultural courses were attended by 1,500 young men and 400 young women, the latter, for the most part, taking the courses in horticulture and dairying. Fifteen of the schools have land for demonstration purposes, ranging from one-fifth of an acre to 18 acres, and 21 have special agricultural laboratories well equipped with special apparatus.

Report of Alnarp Agricultural and Dairy Institute and of Alnarp Agricultural School and Farm, 1913 (*Ber. Verks. Alnarps Lantbr. och Mejeri Inst., 1913, pp. 97+29, pl. 1, figs. 6*).—This is a report on the activities of this institution for 1913.

[Training teachers to teach nature study] (*Nature-Study Rev., 11* (*1915*), *No. 9, pp. 393–402, 412–418*).—This number includes the following articles on the training of teachers of nature study: Training Teachers to Teach Nature Study, by Alice J. Patterson, in which a method course, including a study of material and children, is discussed for prospective teachers; Training to Teach Nature Study in Ontario, by John Dearness, describing the work in the normal schools of Ontario; Subject Matter Versus Method in the Normal School, by G. H. Trafton, holding that a course in nature study in the normal schools should treat both of subject matter and of method, with special emphasis on the latter; and Course in Nature Study with Prospective Teachers, by F. T. Ullrich, in which are considered some of the problems involved in the proper organization of a course in nature study for teachers, viz, imparting to students a knowledge of materials of the subject, an appreciation of its aims and purposes, the principles that underlie its organization, and the best methods of presentation.

College freshmen as an index of the progress of nature study, J. G. NEEDHAM (*Nature-Study Rev., 11* (*1915*), *No. 9, pp. 408, 409*).—The author calls attention to several difficulties encountered in giving the natural history course required of freshmen during their first term at the New York State College of Agriculture for the purpose of partially overcoming the inability of students to trust their own eyes or to see the thing itself. These difficulties, consisting of a notion on the part of students that a field trip is a picnic and the written record of the work, like the examination paper, an end in itself, and of a desire to avoid wasting any time on things of no commercial value, are generally being eliminated by the nature study movement in the schools.

Instruction in political economy in the lower agricultural schools, M. PROCHASKA (*Land u. Forstw. Unterrichts Ztg., 29 (1915), No. 1–2, pp. 19–25*).—The author discusses the feasibility of the introduction of instruction in political economy into the lower agricultural schools of Austria, both in the one-semester school where it is deemed desirable only in explanation of farm management instruction, and in the two-semester winter school, where one hour a week in the first semester is advocated. He also considers the selection of the subject matter.

Outlines in agriculture, classics, and elementary history (*Topeka, Kans.: Kansas Dept. Ed., 1915, pp. 38*).—This is a supplement to the course of study for rural and graded schools in Kansas for 1914. The outline in agriculture, arranged by months, is for the eighth grade and is based on the text Agriculture for the Kansas Common Schools (E. S. R., 33, p. 494).

Secondary school agriculture, H. W. SMITH (*[Augusta]: Maine Ed. Dept., [1915], pp. 82*).—This pamphlet defines the conditions under which courses in agriculture offered in secondary schools in Maine may be approved for state aid, equal to two-thirds of the amount expended for such instruction, but not to exceed $500, and offers suggested outlines for a course in agriculture, with suggested practicums and lists of apparatus and reference literature for each subject.

Agriculture (In *Course of Study for the Common and Graded Schools of North Dakota, 1915. Fargo, N. Dak.: State Dept. Ed., 1915, pp. 111–120*).—Instruction in elementary agriculture is outlined for the seventh and eighth grades by months for the common and graded schools of North Dakota.

Environment of plants.—I, Air, water, heat, light, J. W. HOTSON (*Wash. [State] Dept. Ed. Bul. 23 (1915), pp. 41, figs. 14*).—This manual for high schools contains exercises on air, water, heat, and light, and on plants in their relation to these factors.

Soils laboratory manual and note book, J. F. EASTMAN and K. C. DAVIS (*Philadelphia and London: J. B. Lippincott Co., 1915, pp. 87, figs. 21*).—The authors outline 33 exercises in soils, including a study of plowing and an examination and discussion of tillage machinery, for students in high schools and agricultural schools or colleges. Blank pages for student's notes or report are included.

Bread and bread making, NORMA J. DAVIS (*Agr. Ext. Bul. Univ. Nev., 3 (1915), No. 4, pp. 15, fig. 1*).—This bulletin comprises the first six lessons of a home economics extension course in foods designed to cover approximately eight months with one theoretical and practical lesson every two weeks. The course may be carried on in connection with the public schools, through local clubs, or by individual girls. The lessons deal with the history, physics, and chemistry of bread, mechanics of bread making, bread judging, and recipes.

MISCELLANEOUS.

Twenty-eighth Annual Report of Alabama College Station, 1915 (*Alabama Col. Sta. Rpt. 1915, pp. 40*).—This contains the organization list, a financial statement for the fiscal year ended June 30, 1915, and reports of the director and heads of departments on the work and publications of the station during the year.

Report of Kansas Station, 1914 (*Kansas Sta. Rpt. 1914, pp. 80, figs. 21*).—This contains the organization list, a financial statement for the fiscal year ended June 30, 1914, a report of the director summarizing the work and publications of the station, that portion dealing with nutrition investigations with animals being abstracted on page 665 of this issue, and a special article, abstracted on page 632.

Twenty-fifth Annual Report of Kentucky Station, 1912 (*Kentucky Sta. Rpt. 1912, pp. XXXII+36+556, pls. 79, figs. 42*).—This contains the organization list, a financial statement for the fiscal year ended June 30, 1912, a report of the director on the work and publications of the station during the year, an article in memoriam of the late Dean Scovell noted below, reprints of Bulletins 159–168, previously noted, and reports of analyses of mineral waters and meteorological data, abstracted elsewhere in this issue.

Twenty-sixth Annual Report of Kentucky Station, 1913 (*Kentucky Sta. Rpt. 1913, pp. XLVIII+27+624, pls. 29, figs. 57*).—This contains the organization list, a financial statement for the fiscal year ended June 30, 1913, a report of the director on the work and publications of the station during the year, an account of the dedication of the station building, including the papers presented, reprints of Bulletins 169–177, previously noted, and reports of analyses of mineral waters and meteorological data, abstracted elsewhere in this issue.

Twenty-seventh Annual Report of Kentucky Station, 1914, Part 1 (*Kentucky Sta. Rpt. 1914, pt. 1, pp. IX+124, pls. 9*).—This contains the organization list, a financial statement for the fiscal year ended June 30, 1914, a report of the director on the work and publications of the station during the year, departmental reports, reports of analyses of mineral waters, and meteorological data. The experimental work recorded is for the most part abstracted elsewhere in this issue.

Biennial Report of the Director of the Kentucky Station, 1914–1915, J. H. KASTLE (*Kentucky Sta. Bien. Rpt. 1914–1915, pp. 85, figs. 18*).—This contains the organization list, a list of publications, and a review of the work of the station for the biennium ended June 30, 1915. The experimental work reported is for the most part abstracted elsewhere in this issue.

Twenty-eighth Annual Report of South Carolina Station, 1915 (*South Carolina Sta. Rpt. 1915, pp. 36*).—This contains the organization list, a report of the director on the work of the station, a financial statement for the fiscal year ended June 30, 1915, and departmental reports, of which that of the horticulturist and the botanist and plant pathologist are abstracted elsewhere in this issue. The report of the associate agronomist contains brief cultural notes on cotton, corn, oats, rye, barley and wheat, and on cowpeas, sorghums, Sudan grass and Rhodes grass for hay.

Twenty-fifth Annual Report of Wyoming Station, 1915 (*Wyoming Sta. Rpt. 1915, pp. 51–131, figs. 21*).—This contains the organization list, a financial statement for the fiscal year ended June 30, 1915, reports of the director and heads of departments, that of the agronomist being abstracted on page 629 of this issue, meteorological observations noted on page 615, and three special articles abstracted elsewhere in this issue.

Monthly bulletin of the Western Washington Substation (*Washington Sta., West. Wash. Sta., Mo. Bul., 3 (1916), No. 10, pp. 20, figs. 4*).—This number contains brief articles on the following subjects: Feeding Dairy Cows, by H. L. Blanchard; Plant Propagation by Cuttings, by J. L. Stahl; The Choice of Crops, by E. B. Stookey; Comparison of Methods of Managing Pullets, by Mrs. G. R. Shoup, abstracted on page 669.

The life and work of Melville Amasa Scovell, J. H. KASTLE (*Kentucky Sta. Rpt. 1912, pp. 1–36, pls. 2*).—A biographical account of the late Dean Scovell, including a review of the establishment and work of the Kentucky Station, a list of his station publications, and tributes to his memory. See also a previous article (E. S. R., 27, p. 401).

NOTES.

Kansas College and Station.—Recent appointments in the division of college extension include T. H. Parks as specialist in entomology, who assumed his new duties March 16; Miss Florence E. Byrd, at present head of the department of home economics at DePauw University, as assistant in boys' and girls' clubs, beginning September 1; and R. O. Smith as agricultural agent for Wilson County. John L. Bayles has been appointed assistant in crops at the Garden City substation.

Maryland Station.—A bill recently passed by the legislature provides an appropriation for the station of $25,000 per annum for the ensuing biennium as well as $5,000 per annum for the work at the Ridgely substation.

Massachusetts College.—The annual Farmers' Week, held from March 13 to 17, is considered unusually successful. The program was divided into eight sections, including field crops and farm management; animal husbandry; dairying and the handling of dairy products; poultry husbandry; market gardening, fruit growing, floriculture, and forestry; home economics; farmers' business organization; and beekeeping.

Michigan College.—J. H. Carmody, whose resignation from the Kentucky University has been previously noted, has been appointed horticulturist in the extension division.

Mississippi Station.—The appropriation bills for the various substations were vetoed by the governor, but subsequently were passed over his veto by a considerable majority.

Missouri University and Station.—D. H. Doane, professor of farm management and state leader of county agents, and C. A. LeClair, assistant professor of soils, have resigned to engage in commercial work. J. C. Hackleman, assistant professor of farm crops, has been transferred to the extension service and B. F. Geisert, assistant in agricultural extension, has resigned.

Cornell University.—W. M. Peacock, assistant in farm crops, resigned January 1 to become instructor in farm management at the Massachusets College.

Ohio Station.—B. M. Stubblefield has been appointed assistant in soils in the station.

Oregon Station.—H. M. Carnes, research assistant in farm crops, has resigned to engage in farming and has been succeeded by H. A. Schoth. J. R. Winston, pathologist in charge at the Hood River substation, has resigned to accept a position with this Department. G. F. Moznette has been appointed research assistant in entomology.

Utah College and Station.—Dr. E. D. Ball, director of the station and school of agriculture, has resigned to take effect at the end of the year. Dr. F. S. Harris, agronomist and director of the school of agricultural engineering, has been appointed director of the station, and Dr. G. R. Hill, jr., now botanist and plant pathologist, director of the school of agriculture. J. T. Caine, III, has been appointed director of extension work; Dr. R. J. Evans, assistant director; and Lorin A. Merrill, assistant state leader. E. P. Taylor, of the extension service of the University of Idaho, has been appointed professor

of horticulture; O. W. Israelsen, instructor in irrigation in the University of California, assistant professor of irrigation; and D. W. Pittman, assistant agronomist.

Agricultural Education in Canada.—The University of British Columbia is offering this year as an elective to junior and senior students in arts, a course on the scientific basis of agriculture. This course is not designed to give advanced instruction in the sciences underlying approved agricultural practices, but definite application of the scientific principles underlying these practices is made in the discussion of the practices themselves.

The course has been divided into two main divisions, viz, (1) a study of the evolution of agricultural practices in relation to tillage, crops, and live stock, and a discussion, in connection with the advances in the practices noted, of the contributions made by science in this development; and (2) subjects which are the natural outgrowth of the first, embracing a consideration of economic, social, and educational problems in relation to country life, with a discussion of the movements now under way looking to their solution. This course is offered in view of the increasing demand, not only from teachers in the public elementary and high schools but also from graduates in arts, theology, or medicine, whose professional work brings them into more or less direct contact with the rural population.

A new science building was formally opened January 11 at the Nova Scotia Agricultural College. This is a two-story and basement brick structure 120 by 50 feet, equipped with laboratories, offices, and classrooms for chemistry, soils, entomology, plant pathology, and domestic science, and an assembly room.

The Ontario Agricultural College has recently completed a four-story brick building 101 by 70 feet for teaching and research in soil physics.

An article in the March issue of the *Agricultural Gazette of Canada* describes the equipment and accommodations of typical offices of the district representatives in Canada, much diversity being shown. At Lawrencetown, Nova Scotia, a $3,000 agricultural demonstration building has been erected from Dominion and county funds and private subscriptions, which it is proposed to use as agricultural headquarters for the community. The building contains a lecture hall, seating about 75 people, and a large room for a museum and repository.

A somewhat similar building has been erected at Antigonish, Nova Scotia, by the municipality, the local board of trade, and the provincial government. It contains a large pavilion which in winter provides room for short courses in agriculture, supplying accommodations for 300 persons with room for live-stock classes and demonstrations. At other times this space is available as a temporary farmers' warehouse or for poultry shows, agricultural society meetings, etc.

F. W. Schofield, instructor and investigator in bacteriology in the Ontario Veterinary College, has accepted an appointment to take charge of work in public health and bacteriology in the Severance Medical School of Corea.

Horticultural Experimental Work in Denmark.—A new station has been established at Blangsted pr. Odense, Denmark, and that at Esbjerg has been enlarged and taken over by the state as a branch station. A third station is to be established in northern Jutland during the present spring. These stations will collectively occupy an area of over 250 acres. Niels Esbjerg has been appointed in charge of the horticultural work at the various stations.

New Experiment Station in Burma.—A new experiment station was opened last year at Yawnghwe to be devoted to wheat and other crops of the Southern Shan States. It has an annual maintenance grant of $973, and takes the place of the old government garden at Taunggyi, which was sold in 1914.

A new seed farm has also been opened at Yedashe in charge of the district agriculturist of the Toungoo district.

School of Tropical Agriculture in Ceylon.—According to *Tropical Life*, the new School of Tropical Agriculture at Peradeniya, Ceylon, was opened to students on January 8. R. N. Lyne, the director of agriculture, is principal and C. Drieberg, vice-principal.

Applicants for admission must be 17 years of age and have passed the eighth grade or its equivalent. Each student is required to cultivate a plat, growing thereon various economic products for which credit will be given toward a school certificate. The course, which extends through one year of three terms, includes the following subjects: Soils, fertilizers, the plant, chemistry, economic products, agricultural engineering, the animal, and crop pests and plant diseases. The mornings will be devoted to practical instruction in the botanic gardens and experiment station.

The school is intended primarily for the training of teachers in the vernacular schools with the view eventually of making agriculture a compulsory subject in the code. Instruction in English will also be given for the sons of landowners and others who intend to take up plantation work as a career.

Sectional Conferences on Secondary Agricultural Instruction.—A series of sectional conferences of those interested in the preparation of teachers of secondary school agriculture is being held from time to time. The first of these conferences was at Columbus, Ohio, February 22, 1915, to consider the general problem of training teachers of agriculture for the secondary schools of the North Atlantic States.

On April 26, 1915, a similar conference was held at Chattanooga, Tenn., for the Southern States, and a second conference for the North Atlantic States October 22 and 23, 1915, at New York City.

The first conference for the North Central States was held at Purdue University, February 19, 1916. About nine States were represented, with an attendance aggregating about 45 and composed mainly of professors of agricultural education in the land-grant colleges and supervisors of secondary agricultural instruction in state departments of public instruction. The meeting was opened with an address by President W. E. Stone on Teacher-training for Secondary Agricultural Education. The presiding officer was C. H. Lane, of the States Relations Service of the U. S. Department of Agriculture, who declared that it was the purpose of the conference to formulate a tentative four-year course of study to be offered at land-grant colleges and other institutions which will fit men to teach agriculture in the secondary schools of this section. A suggestive course in agriculture for normal schools and colleges in Indiana which give teacher-training courses was used as a basis for discussion.

The conference went on record as favoring from 140 to 144 semester hours as a requirement for graduation, and from 15 to 18 hours as approximately the amount of time which should be given to professional work including practice teaching. It favored 40 per cent of technical work in agriculture as a minimum in the four-year course, with 12 semester hours of English, including public speaking, and believed that mathematics as now given in most of the land-grant colleges and modern languages should not be required.

A report from a committee on institutional relations was adopted, which recommended that the land-grant colleges cooperate with other colleges and normal schools in their respective States in formulating courses for training teachers of agriculture with a view to the standardizing of courses. The object sought was an interchange of credits to minimize the loss of time on the part of students who may shift from the normal school to the land-grant college.

The conference endorsed the policy of holding a general session at the time of the Association of American Agricultural Colleges and Experiment Stations for men engaged in secondary agriculture, and also the continuation of sectional meetings, these to be held at Chicago. The topic recommended for the next meeting was the general relationship of the agricultural college to the problem of secondary agricultural education. The conference also advocated the gradual adoption of a four-year course in agriculture by secondary schools; the largest possible opportunity for practical work and experience in connection with all secondary courses in agriculture, first, through home projects, and second, where possible, through the school plat; and the requirements that teachers of secondary agriculture must have preparation equivalent to a four-year college course, including special professional training and at least one year of farm experience, and that the supervision of secondary agriculture should be conducted by the college of agriculture with the cooperation of the state department of education.

On February 26, 1916, the third conference for the North Atlantic States was held in New York City. One session was given over largely to the discussion of a suggestive outline of a four-year training course to be offered in the agricultural colleges of this region. It was maintained in the discussion that the agriculture needed in secondary schools is not technical but practical agriculture, and that highly specialized courses in the college do not give the best preparation for prospective teachers.

Limited specialization was deemed important for teachers in high schools, but the perspective, outlook, and appreciation that comes early from the pursuit of a fundamental, broad course in their field of instruction was regarded as more important. The first two years of this course provides for credit to those men who have had good agricultural courses in the high school and offer introductory or fundamental courses in each of the various divisions of agricultural science, such as soils, farm crops, animal husbandry, etc. The minimum for the two years, based on 18 hours per semester, is agricultural subjects 24 hours, sciences 24 hours, humanistic subjects 15 hours, electives from science or agriculture 6 hours, and optional 3 hours.

For the junior and senior years a minimum is suggested of agricultural subjects 12 hours, sciences 12 hours, humanistic subjects 12 hours, professional subjects 9 hours, special methods in secondary agricultural education 12 hours, electives from the above groups 9 hours, and optional 6 hours. The 9 hours of electives provide to some extent for specializing in some one field of agriculture during the junior and senior years, and the 6 hours optional take care of a deficiency in some department.

The content of courses in special methods and practice teaching at the New York State College of Agriculture was discussed by G. A. Works. These courses include the organizing of the subject matter from the standpoint of the secondary school, a consideration of the time which should be allotted to the different topics in a given community, and the organization of subject matter for home projects in agriculture, with special reference to the plan outlined by the New York State Department of Education.

Some time is also devoted to a study of the extension work of the high school teacher of agriculture, a method of cataloguing station and government publications for instructional purposes, the selection of chart material and the actual making of charts for high school purposes, visits to high schools where agriculture is being taught, a study of text-books in agriculture, and the planning of rooms for agricultural instruction in high schools. Actual practice in teaching as an assistant to a regular instructor in agriculture in one of the public high schools is also offered. This year ten seniors have spent one-half year in this

way, the state department of education paying one-third of their salary and the college of agriculture the remainder.

Federation for Rural Progress.—The tenth annual meeting of this organization was held at Boston, Mass., March 3. The day preceding the meeting was devoted to thirteen sectional meetings of the various rural activities represented, such as the agricultural colleges and experiment stations, boards of agriculture, agricultural associations, etc.

The federation program was opened by an address by Dr. A. C. True, director of the States Relations Service of this Department, entitled Fundamental Points in the Relationship Between the Various Agricultural Agencies Receiving Aid from Taxation. Dr. True explained the functions of the various agencies, advocating that regulatory functions, collection of statistics and similar information, and the promotion of fairs be conducted by the state boards of agriculture, the colleges confining themselves to the educational functions of teaching, research, and extension work. He favored the establishment of strong state departments of agriculture on somewhat the federal plan of organization, and independent of the governing board of the colleges.

Dr. True also called attention to the wide range of duties now being attempted by many of the county agents. He believed that if their work is to be satisfactory and efficient these offices must hold strictly to educational work, as "teachers of practical truth and organizers of the farming people to receive and practice such truth taught to them through demonstration methods." Clear definition and differentiation of the functions of each of the various agricultural agencies, so far as feasible, in statutes and administrative regulations, and the cultivation and practice of the cooperative spirit and method, he deemed vital to satisfactory relationships between the various public agencies.

The functions of the experiment stations were further discussed by Director C. D. Woods, of Maine, those of the extension service by Director W. D. Hurd, of Massachusetts, and those of the state departments of agriculture by E. S. Brigham, of Vermont.

An afternoon session was devoted to a discussion of dairy problems with addresses by F. Rasmussen, of New Hampshire, and others. A resolution offered by President K. L. Butterfield was adopted, requesting the executive committee to consider the advisability of inaugurating an educational campaign in behalf of dairying.

Officers were elected as follows: President, L. H. Healy, secretary of the Connecticut Board of Agriculture; vice-president, E. S. Brigham, commissioner of agriculture of Vermont; secretary-treasurer, J. A. McKibben, secretary of the Boston Chamber of Commerce; executive committee, President Butterfield, W. N. Cady of the Vermont State Grange, J. B. Abbott, state leader of the farm bureau work in New Hampshire, C. O. Purrington, lecturer of the Maine State Grange, Director B. L. Hartwell of the Rhode Island Station, and H. J. Baker, director of the extension work in Connecticut.

Graduate School of Agriculture.—The seventh session of the school is to open at the Massachusetts Agricultural College July 3 and will close July 28. Among the speakers at the formal opening exercises on July 5 are Dr. H. P. Armsby, chairman of the committee on graduate study of the Association of American Agricultural Colleges and Experiment Stations; Dr. A. C. True, director of the States Relations Service, who will serve as dean of the school; and President K. L. Butterfield of the college.

The courses will be arranged under the general headings of growth, agricultural education, production, distribution, and rural organization and land problems. In the course on growth the subjects to be considered are its dynamics, elemental chemical synthesis, organization or cellular entity, and

growth relations, one week being allotted for each topic. There will also be an adjunct course running through the entire session to provide a review of the physico-chemical elements involved in growth.

The work in agricultural education will be given the first week of the school and will deal with the foundations of pedagogy and methods of teaching, followed by seminars on the practice of teaching.

The study of agricultural production, given the second week, will deal with fundamental factors which govern success in agriculture, including accounting and business methods. The seminars in this course will include discussions of the factors of production in orcharding, market gardening, floriculture, dairying, and poultry husbandry. There will also be conferences on the scientific basis of agriculture.

The work in distribution and marketing will include lectures and seminars during the third week, as well as conferences on farm finance and making the farm pay. During the fourth week lectures will be given on land problems, supplementing the work on production and including sociological studies. There will also be lectures, seminars, and a conference on rural organizations.

At the close of the school an eight-day automobile excursion has been arranged which will afford opportunities to observe some features of the intensive agriculture of New England.

"Ground Levels in Democracy."—Dr. L. H. Bailey has assembled the addresses delivered by him as vice-president of Section M (Agriculture) of the American Association for the Advancement of Science, and two others of similar character, and published them privately under the title Ground Levels in Democracy. He offers to send the book free, to persons interested, upon application to his home address, Ithaca, N. Y.

Miscellaneous.—According to a note in *Science*, Sir Eustace Gurney has offered to Cambridge University a tract of 257 acres with a view to encouraging the study of forestry.

The journal hitherto known as the *Journal of Economic Biology* is to be confined to original research in systematic and anatomical zoology, and has been renamed the *Journal of Zoological Research*.

La Enologia Argentina is an illustrated monthly journal, devoted to enology, viticulture, general agriculture, etc., and issued as the organ of the enological and viticultural center at Mendoza, Argentina.

Theodore Pergande, scientific assistant in the Bureau of Entomology, died March 23 at the age of 76 years. He had been connected with this Department since 1878 and had worked especially with the Aphididæ.

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[a] Printed in scientific and technical journals outside the Department.

EXPERIMENT STATION RECORD.

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At the time the Hatch Act was passed in 1887, establishing the agricultural experiment stations, no one but a seer could have prophesied the growth and development which these institutions were to undergo or the place they would occupy in the realm of scientific investigation. In fact, it required a keen appreciation of the possibilities of scientific research and a far-sighted vision of the future needs of agriculture to sense the necessity of providing for experiment stations at all. Why, it was asked, should the Federal Government be called upon to found a system for experimentation in agriculture when many persons were still stoutly maintaining that successful farming required only common sense, muscle, and machinery, and that science as applied to this most ancient of arts was theoretical and unpractical and had little to do with the real business of life?

Thirty years ago all research in the United States was relatively restricted in scope and amount, and this country had, in fact, hardly caught its spirit or import. Science itself still seemed to be a purely academic affair which rarely bore any obvious relation to the practical world, and research was deemed a sort of intellectual exercise for a special class. The rigid scholastic conception of pure science as contrasted with applied science was widely prevalent. The ideal investigator was thought of as a kind of crusader who enlisted with almost religious fervor under the banner of truth, with the battle cry of truth for truth's sake and science for science's sake; but too often truth and science were regarded as purely abstractions in the realm of ideas with no necessary connection with the world of concrete things.

Research gained a solid footing earliest in endowed colleges, universities, and institutions established for investigation in special lines, but its development there was generally quite limited. It was largely concerned with abstract propositions, and its activities were regarded with curiosity rather than with comprehension or understanding. Least of all was it looked for at the agricultural colleges, which were expected to interest and instruct their farmer constituents through their model farms and superior live stock, and were thought of by other classes of colleges as being distinctly elementary and vocational rather than for the broad advancement of learning.

How remarkable, therefore, that these same agricultural institutions should in so short a period have become great centers of investigation and in a measure set a pace for it which has been reflected in many other classes of institutions. It is probably not too much to say that they have been the greatest single agency for stimulating research in its varied branches by force of their example and success, their closeness to the people, and the confidence and understanding which they have won for experimental inquiry. Agricultural investigation has shown, as no other class of investigation had previously shown, the direct practical relations of such activity to every-day life and to human welfare, and has popularized it in the mind of the people. This interest has been extended to the various departments of science in general.

With this widespread acceptance and approval of the stations by the general public has come an increasing realization of their achievements and opportunities by the scientific world. The impression formerly more or less current in scientific circles that agricultural investigation was hardly comparable in quality with the research carried on at endowed universities and similar institutions is rapidly becoming dispelled. To-day the stations are not only recognized as important and valued factors in the advancement of knowledge and its application to the improvement of mankind, but as possessing many and unique advantages as fields of opportunity for the man with high scientific attainments and the desire to carry on research.

Conditions have radically altered since the days when station positions were, as a class, too often thought to offer little of promise to such a man. The station staffs have come to include some of the best-trained men in the country. In biology, chemistry, physics, and other sciences, vacancies in the station ranks are being sought by candidates of high qualifications as comparable with, and in some respects even preferable to, opportunities open to them elsewhere. It may be of interest to note briefly some of the reasons for this change of attitude and some of the considerations which now render these positions so attractive.

In the early days of the experiment stations their resources were small and their outlook for development uncertain. They themselves were looked upon as experiments and had first of all to demonstrate their right to existence. A full-fledged system of purely research institutions was impossible under these conditions, and a period of transition was inevitable.

With the small funds at the disposal of the stations it was necessary to practice economy in all directions. Equipment was frequently inadequate and suitable laboratories, library facilities, and similar needs were too often wanting. Even the number of men which an institution could afford to maintain upon its staff was greatly limited.

The field of agriculture, however, was broad and its needs urgent, and in the attempt to cover it the scope of each man's province was correspondingly widened. We thus had at the start such somewhat anomalous titles for heads of departments as agriculturist and horticulturist, and a proportionate scarcity of real specialists.

The station scientist was called upon to do much teaching in the agricultural college, both to four-year students and in short courses. Some effort was made to adjust the demands of his dual functions so that the one would not too greatly interfere with the other, but this was not always arranged primarily from the point of view of the station. As the number of students in the colleges increased, the burden of the instruction staff naturally became even heavier, and to the duties of teaching were added those of organizing departments, advising students, and other administrative requirements.

In order to bring the results of scientific work more speedily before the farmers it was deemed wise to expend some efforts in extension work. The station worker was expected to do more or less speaking at farmers' institutes and similar gatherings, and to prepare popular articles for the farm press, as well as to serve as a sort of consulting expert in answering inquiries for general information and the like. All this still further lessened his opportunity for research.

Even such time as was available for station work was in great demand for a variety of matters which seemed to require immediate attention in spite of their rather simple and elementary character. Individual farmers proposed problems for which they expected and needed an early solution, and some of these problems seemed to merit immediate study, even though it meant a postponement of more fundamental inquiries.

Then again, there was only a very limited body of agricultural knowledge in this country, and to meet this deficiency there were borrowed from Europe results which had already been established by investigators there. Thus, data concerning the nutritive value of feeds and the theoretical nutritive requirements proposed by European investigators were taken almost bodily for application to American conditions, and similar recourse, in the absence of domestic information, was had to European conclusions regarding soil fertility, plant physiology, and the control of fungus diseases. This was, of course, realized to be merely a makeshift to tide over the interval necessary to complete experiments, but none the less it tended to create the impression that the stations were to a considerable degree disseminators of existing information rather than centers of original research.

More discouraging than these material obstacles to the would-be research worker, however, was the uncertainty which prevailed as to the real function of the experiment station and the ultimate develop-

ment of agricultural investigation. On these points the ideas held by the station workers themselves were at variance, and the general public was naturally in even greater need of enlightenment as to what might be done and how much could reasonably be anticipated. Some people, as already indicated, expected little or nothing in a practical way to come from any form of scientific inquiry, but others, with an over-confidence in the immediate effect of the legislation establishing the stations, apparently regarded it as a panacea for all the ills of farming. The stations were looked to for prompt and authoritative answers to practically all questions relating to agriculture, and when urgent problems were presented some impatience was expressed if quick results were not forthcoming. These insistent demands for immediate returns inevitably influenced some station workers against their better judgment to try short-cuts in the solution of a problem in hand, to rely upon superficial methods of inquiry, and to publish the results of their findings too soon. Such practices did much in certain instances to prolong the unfavorable impression as to the thoroughness and accuracy of station work, and even to raise the question as to whether high-grade research in agriculture was a possibility.

Unfortunate and discouraging as were some of the deficiencies and mistakes of the early beginnings, it should not be forgotten that many of them were well-nigh unavoidable. The stations represented a new experiment in establishing research on a popular basis. They were developing for it new relationships and dependencies, winning their way, building a support for their work which would in the end afford larger opportunity. It was not so much that ideals were lacking, although these were not always of the highest, as that the conditions had first to be made right. The public, and not a few individuals, had to be convinced of the practicability of a system of research in agriculture and a foundation laid in public sentiment.

Little by little most of the disadvantages formerly surrounding the stations have been overcome. Increased popular appreciation has brought with it enlarged resources, and these have made possible more adequate equipment, better trained assistants, closer differentiation in both subject matter and kind of activity, relief from a variety of distracting duties, and opportunity for concentration upon problems worthy of study. Fortunate, indeed, is the endowed university or similar institution now possessing superior advantages along these lines.

Statistics recently tabulated by the States Relations Service show that for the fiscal year ended June 30, 1915, the total revenue of the sixty experiment stations reporting was $5,286,382.53. This is an average for each State of over $100,000, equivalent to the interest at

five per cent on an endowment of $2,000,000 each. Some of this, to be sure, is appropriated for regulatory service and other non-research work, yet the showing is still impressive as an indication of their resources and permanent footing.

Data are not at hand as to the funds available for research in privately supported educational institutions, but it is a reasonable assumption that in few instances would those of the stations suffer by comparison as to either adequacy or stability. In addition it may be pointed out that projects financed by the Federal funds are undertaken under definite plans, many of which, especially in the case of the Adams projects, contemplate their continuation for five to ten years or more, under allotments sufficient to guarantee their efficiency and uninterrupted prosecution.

Additions to the equipment of the stations during the year aggregated $1,135,980.04. Of this amount $537,665.45 was for buildings, $40,544.05 for the libraries, and $130,754.74 for apparatus, as well as $85,768.13 for farm implements, $196,784.02 for live stock, and $144,463.65 for miscellaneous purposes. Most of these figures are larger than in previous years, but they are not deemed abnormal, and may fairly be cited as evidence that the stations as a class are providing their staffs with facilities far more adequate than is common, except at a very few special institutions.

The more adequate support of the agricultural colleges, coupled with the passage of the Smith-Lever Act and other provisions for extension work, are largely relieving the station worker of other duties. Of the 1,857 members of the station staffs last year, but 892 were also engaged in instruction and but 466 were assisting in extension work. That as favorable conditions do not always exist elsewhere may be inferred from a recent address of Dr. Jackson, of the University of Minnesota, entitled Obstacles to Research, in which he says that "even more than lack of facilities, lack of time is an obstacle very frequently encountered by university research workers. Many university men are carrying the burden of research and teaching, which, if well done, must encroach upon time absolutely essential for serious research work. In many cases a considerable amount of routine administrative duties, committee work, etc., is added."

Station work has been organized on a more logical basis than formerly, the subject matter has been subdivided, and the services of specialists extensively employed. Instead of an undifferentiated department of horticulture we may now find plant breeders, physiological botanists, pomologists, and the like. Agronomy has resolved itself into soil physics, chemistry, bacteriology, farm crops, etc. At the same time the boundaries between the general sciences have

been broken down as the interrelations of the various branches have become apparent. The physicist has been enlisted in soil investigations, the biologist in studies of the laws of inheritance in plants and animals, the chemist in determining the function of new groups of food constituents, the engineer in the provision and employment of water, etc.

Marked progress has been made in bringing about an enlarged public understanding of the methods of research. It is now generally recognized that the solution of most agricultural problems requires time, and that it can not be safely hurried. We less often hear impatience expressed at the failure to solve a problem in a few months. The general public has better learned to trust the judgment and ability of the station worker, and to await with patience and confidence the completion of his efforts. Likewise, there has come about a realization by scientific men of the fallacy in the old view that there is necessarily an inferiority about work which, to quote President Woodward, of the Carnegie Institution of Washington, "is often designated by the ambiguous word 'practical,' or by the misleading phrase 'applied science,'" and an acknowledgment that "in so far as it deals with facts and principles and substitutes knowledge for ignorance, it is worthy of prompt recognition and unstinted support."

More attractive, however, in the eyes of the true investigator than fine laboratories, or otherwise congenial environment is the opportunity afforded for productive research. In this respect the stations now offer an especially attractive field. Where to such an extent as in agriculture can be found problems of such varied complexity and immediate and wide application? Agriculture in its present stage involves a contest with the elements and with industrial and economic conditions. Its problems are ready-made and pressing, not to be postponed without loss and sometimes hardship. Millions of dollars and the prosperity of whole sections of our country may be at stake in an investigation of a new disease of plants or animals, the utilization of a by-product, or the more intelligent use of the soil. The very size and indispensability of the industry and the difficult character of many of the problems involved in it furnish an unusual inspiration. The subject taxes the ingenuity, the scientific ability, and the acumen of the investigator and gives as large a range for his efforts as any known field of inquiry. Modern agriculture is a harnessing, control, and utilization of the elements and phenomena which operate in accordance with the scientific and economic laws. In its form and content at any stage it exemplifies in a significant degree the status of man's knowledge and mastery of natural forces.

In the early days the demand for immediate practical results was often accompanied with the insistence, even by boards of control and administrative officers, that the experimenters should be chosen primarily because of their practical knowledge of farming or horticulture. But now it is seen that investigators without scientific training are not likely to obtain anything more than superficial or empirical results. Hence the standard of scientific training for station workers is steadily rising. Men with elaborate and advanced training along scientific lines are in demand for the specialized positions now open in the stations. Young men, therefore, have a strong incentive to prepare themselves thoroughly for research in agriculture.

The wide and rapid spread of extension work in agriculture, until it now covers practically all phases of agriculture throughout the United States, is already beginning to increase the opportunities of well-trained men to engage in agricultural research. The large number of well-paid positions opening in the extension work is attracting from the ranks of station workers those who are more interested in popular phases of agricultural work. Thus the opportunity is often given to put in their place better trained men with a more serious interest in research. The extension workers are also creating a broader demand for more complete investigations, the results of which can be used in demonstrations among the farmers or in answering inquiries pressed home upon the extension men now living in close contact with the farmers. As time goes on extension work will inevitably become more highly specialized and the demand for new knowledge to be put to practical use will grow apace. With such a backing of widespread interest in the improvement of agricultural practice based on the results of scientific research, there is every reason to believe that the opportunities for the stations to strengthen and enlarge their researches will steadily grow.

All these facts are becoming widely known and appreciated in the scientific world. They present considerations which count for much among investigators, and explain the prestige which the stations are acquiring as desirable fields of opportunity. It is fortunate that the stations are thus coming into their rightful position, for the unsolved problems in American agriculture are many and intricate and their importance justifies the enlistment of the services of the best-trained scientists of the land in their solution.

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RECENT WORK IN AGRICULTURAL SCIENCE.

AGRICULTURAL CHEMISTRY—AGROTECHNY.

The casein and salts of goat's milk, A. W. Bosworth and L. L. Van Slyke (*New York Sta. Tech. Bul. 46 (1915), pp. 3–15; Jour. Biol. Chem., 24 (1916), No. 3, pp. 173–189*).—Continuing earlier work (E. S. R., 33, p. 660) an investigation was made of the chemical composition of goat's milk.

The casein prepared from goat's milk forms a series of compounds with bases which indicate that its valence, combining proportions, and molecular weight are the same as that of the casein of cow's milk.

The soluble constituents of goat's milk are sugar, potassium, sodium, and chlorin. The albumin, inorganic phosphates, calcium, magnesium, and citrates are partly in suspension and partly in colloidal solution. The fat and casein are entirely in colloidal solution.

The real acidity of the milk, obtained after precipitating the calcium with neutral potassium oxalate, is considerably less than that of cow's milk. Goat's milk, in contrast to cow's and human milk, contains tricalcium phosphate. The total amount of salts in human milk is about one-third that in cow's or goat's milk. The number of different salts appears to be greater in goat's milk, and the amount of chlorids is greater than in either human or cow's milk.

Based on the results of their study, the authors suggest the following as representing, in percentages, the forms in which the constituents may be present in the milk: Total solids 12.34, fat 3.8, milk-sugar 4.5, proteins combined with calcium 3.1, dicalcium phosphate 0.092, tricalcium phosphate 0.062, dimagnesium phosphate 0.068, trimagnesium phosphate 0.024, monopotassium phosphate 0.073, potassium citrate 0.25, potassium chlorid 0.16, calcium chlorid 0.115, and sodium chlorid 0.095.

Analyses of 23 samples of milk from 11 goats are appended.

The formation of protein and humin substances, L. C. Maillard (*Genèse des Matières Protéiques et des Matières Humiques. Paris: Masson & Co., 1913, pp. XI+423, pls. 2*).—This volume constitutes an account of the author's researches on the formation of protein and humin substances. It contains an introduction and four main parts, together with a general résumé and conclusions.

Experiments on the synthesis of polypeptids, peptones, and proteins by means of enzyms, E. Abderhalden (*Fermentforsch., 1 (1914), No. 1, pp. 47–54*).—After obtaining negative results in an attempt to synthesize higher products from amino acids through the agency of enzyms, the author claims to have obtained positive results by digesting liver, kidney, thyroid, and lung tissue by gastric, pancreatic, and intestinal juices for three months, after which period the biuret reaction was negative in all cases.

A 20 per cent solution of such a digested product was prepared with physiological salt solution, and after being thoroughly boiled was treated with its own respective organ extract and allowed to stand in the incubator for four weeks. At the end of this time biuret tests were made and found to be negative. The preparations were then allowed to stand for five months at room temperature, at the end of which time biuret reactions were positive and quantitative determinations indicated the formation of protein or intermediate products. The experimental results strongly indicate the specificity of enzyms.

The investigation is being continued.

Studies on anthocyans.—II–X, R. Willstätter et al. (*Liebigs Ann. Chem., 408 (1915), No. 1, pp. 1–162*).—Continuing the investigation previously noted (E. S. R., 31, p. 324), the following studies are reported:

II. *Coloring matter of the rose, by R. Willstätter and T. J. Nolan (pp. 1–14).*—The authors have found that cyanin, the anthocyan of the rose, is identical with that of the cornflower. The varieties of color are dependent on the reaction of the cell sap, whether acid, neutral, or alkaline. The white and yellow rose contain practically no anthocyan, the rose-colored one a little, while the dark red rose is rich in an acid-combined coloring matter, the alkali salt of which determines the color of the cornflower. The identity of the anthocyans was demonstrated by the ultimate chemical analysis and by their physical properties. The preparation of cyanidin ($C_{15}H_{11}O_6Cl$) and its pseudobase ($C_{15}H_{12}O_7.H_2O$) further established their identity.

III. *Coloring matter of the red whortleberry, R. Willstätter and H. Mallison (pp. 15–41).*—Idaein was found to contain the same coloring component, cyanidin, as the rose and cornflower, combined with one molecule of galactose. The coloring matter was extracted from the berries by glacial acetic acid and subsequent precipitation from the extract with ether. It was further purified by isolation as the picrate, from which the chlorid was obtained by treatment with methyl-alcohol hydrochloric acid. This method was adopted as one of the common procedures in the isolation of the anthocyans. On hydrolysis with hydrochloric acid idaein yielded cyanidin chlorid and galactose. The cyanidin, on heating with alkali, decomposed and yielded phloroglucinol and ortho dihydroxy-benzoic acid.

IV. *Coloring matter of the scarlet pelargonium, R. Willstätter and E. K. Bolton (pp. 42–61).*—Scarlet pelargonium was found to contain but one coloring substance, pelargonin, which is a diglucosid. On treatment with hydrochloric acid it yielded glucose and the dye-component, pelargonidin, which is analogous to cyanidin. A sulphate, nitrate, and oxalate of pelargonin were obtained, but the picrate could not be isolated. On treatment with alkali, pelargonidin chlorid yielded phloroglucinol and para-oxy-benzoic acid with a trace of protocatechuic acid.

V. *The anthocyan of the larkspur, R. Willstätter and W. Mieg (pp. 61–82).*—Delphinin, the coloring matter of the larkspur, was isolated either in the free state or as the chlorid. On hydrolysis with hydrochloric acid the delphinin chlorid yielded 2 molecules of glucose, 2 molecules of para-oxy-benzoic acid, and 1 molecule of delphinidin chlorid. This anthocyanidin, on heating with 75 per cent alkali, decomposed into phloroglucinol and probably gallic acid which, at the temperature of the reaction, loses carbon dioxid and yields pyrogallol.

VI. *Coloring matter of the grape and the whortleberry, R. Willstätter and E. H. Zollinger (pp. 83–109).*—Enin, the anthocyan of the grape, was obtained by the usual procedure, and purified by isolating as the picrate. Alcohol or alcoholic hydrochloric acid could also be used as extraction agents. From the picrate the enin chlorid was separated as red or brownish-red crystals. The enin is a monoglucosid and, on hydrolysis, yields 1 molecule of glucose and 1 molecule of enidin chlorid. Heated with hydriodic acid the enidin chlorid loses two methyl groups and yields delphinidin. Decomposed with alkali it gives phloroglucinol and a methyl ester of gallic acid.

Myrtillin was obtained from the whortleberry by alcoholic-hydrochloric acid extraction, and purified by isolation as the picrate or chlorid. On hydrolysis with hydrochloric acid it yielded myrtillidin chlorid in dark-brown pointed prisms.

VII. *Coloring matter of Althaea rosea, R. Willstätter and K. Martin* (*pp. 110–121*).—The anthocyan, althaein, was isolated by the alcoholic acid extraction. The chlorid, on hydrolysis, yielded myrtillidin chlorid and a sugar which has not as yet been identified as glucose. Heating with 75 per cent alkali produced phloroglucinol and probably gallic acid. By demethylization with hydriodic acid beautiful crystals of delphinidin chlorid were obtained.

VIII. *Coloring matter of the wild mallow, R. Willstätter and W. Mieg* (*pp. 122–135*).—Malvin, the anthocyan from the wild mallow, was extracted by the usual alcoholic acid procedure. The glucosid, on hydrolysis, yielded malvidin chlorid and glucose. On treatment with hydriodic acid, malvidin yielded delphinidin. The alkali fusion caused a cleavage into phloroglucinol, a trace of a monomethyl ether of phloroglucinol, and probably a monomethyl ether of gallic acid. Tables giving the physical and chemical properties, and showing close relation between the anthocyans and anthocyanidins thus far studied, are included.

IX. *Coloring matter of the peony, R. Willstätter and T. J. Nolan* (*pp. 136–146*).—Peonin is analogous to cyanin which was isolated from the rose. On hydrolysis it yields 2 molecules of glucose and peonidin chlorid. Demethylization with hydriodic acid gives cyanidin. On decomposition with alkali phloroglucinol was identified, but the acid was apparently decomposed by the high temperature necessary for the reaction. The properties of cyanin, peonin, cyanidin, and peonidin are given in tabular form.

X. *Variations in the coloring matter of flowers, R. Willstätter and H. Mallison* (*pp. 147–162, figs. 2*).—It is concluded that the variation of colors in flowers depends on (1) the formation of different anthocyans in one plant or even in a single flower, (2) the varying amounts of the coloring matter present, (3) the reaction of the cell sap, and (4) the mixture with yellow pigments. The anthocyans are amphoteric, and experimental evidence indicates that in red flowers they are combined with acids. In violet flowers they exist as neutral coloring matter, and in blue flowers as alkali or other metallic salts. Among the yellow pigments commonly found are the indifferent carotinoids, chiefly carotin and xanthophyll, the flavone colors combined with a sugar, and the so-called "anthochlor" dyes. The methods used for the isolation of the anthocyans and the preparation of the anthocyanins are reviewed.

The phosphoric acid in starch, J. H. Northrup and J. M. Nelson (*Jour. Amer. Chem. Soc., 38* (*1916*), *No. 2, pp. 472–479*).—The results of an investigation of the phosphorus in starch indicated that it is chemically combined in the starch grains and can not be removed in any form by simple extraction with dilute acid. The presence of phosphorus in starch is not due to contamination. A compound of definite composition, containing a carbohydrate and also having a relatively high phosphorus content, was isolated from partially hydrolyzed starch. The possibility that the compound was derived from proteins in the starch was shown to be very remote.

Alfalfa seed oil.—Alfalfa investigation, VI, C. A. Jacobson and A. Holmes (*Jour. Amer. Chem. Soc., 38* (*1916*), *No. 2, pp. 480–485*).—This is a continuation of investigations reported previously (E. S. R., 32, p. 410).

The oil obtained by extraction with gasoline was found to be a drying oil, with the following constants: Refractive index, at 20° C., 1.477; specific gravity, 0.9117 and 0.9149 at 24°; saponification value, 172.3; iodin value, 154.2; acid value, 2.85; acetyl value, 19.8; Reichert-Meissl value, 0.4; unsaponifiable matter, 4.4 per cent; glycerol (by acetin), 1.97 per cent; saponification value of the acetylated oil, 192.2. In its physical properties it resembles safflower oil. The ground seeds, previous to extraction, yielded the following in per-

centage: Moisture, 6.35; protein, 35.88; ether extract, 11.39; carbohydrates, etc., 32.43; crude fiber, 10.52; and ash, 3.43.

The chemistry of yeast and alcoholic fermentation, H. Euler and P. Lindner (*Chemie der Hefe und der Alkoholischen Gärung. Leipsic: Akad. Verlags Gesell., 1915, pp. X+350, pls. 2, figs. 17*).—In this treatise on yeast and alcoholic fermentation some of the subjects considered are the morphology and classification of yeast, the chemistry of the cell contents, the enzyms of yeast, the chemical processes of fermentation, the metabolism of the yeast cell, the influence of end products on the living cells, toxins, and adaptability and regeneration. The volume contains many illustrations and a complete author and subject index.

A study of the soft resins in sulphured and unsulphured hops in cold and in open storage, G. A. Russell (*Letters on Brewing, 15 (1915), No. 1, pp. 8–23, figs. 10*).—Previously noted from another source (E. S. R., 33, p. 709).

Bákhar.—The Indian rice beer ferment, C. M. Hutchinson and C. S. Ram Ayyar (*Mem. Dept. Agr. India, Bact. Ser., 1 (1915), No. 6, pp. 168, pls. 2*).—Bákhar is an artificial culture containing living fungi or their spores, together with yeast. The former saccharify the rice starch and the latter ferment the sugars thus produced. No uniformity in the number or kinds of molds and yeast was shown by the analysis of samples of bákha from various localities. The saccharifying power of different samples was determined and found to vary greatly. The native method of preparation of the cake was investigated, and the results are reported in detail.

On oxidase enzyms, A. J. Ewart (*Rpt. Brit. Assoc. Adv. Sci., 84 (1914), pp. 577, 578*)—The close correspondence between enzyms and inorganic oxidizers is discussed. The author states that there is no justification for the use of such terms as peroxidase, catalase, enoxidase, and tyrosinase to indicate specific substances, ferments, or groups of ferments. Chloroform strongly, and ether less so, retard or inhibit catalase action, but do not suppress oxidase action except after prolonged contact. Contrary to previous statements, oxidase enzyms are present in the pulp and rind of the orange and lemon and in the stalks, but not in the bodies of the endocarpal hairs. They are also abundant in the phloem, and outer cortex but not in the protoxylem of the carrot. The oxidases of the beet and potato appear to be related and to be among the strongest occurring in plants.

A study of the composition and preparation of Bordeaux mixture, L. Sicard (*Ann. École Nat. Agr. Montpellier, n. ser., 14 (1915), No. 3, pp. 212–253*).—From a series of experiments on Bordeaux mixture the author has found that when pure milk of lime is slowly added with stirring to a solution containing 1 kg. of copper sulphate, the mixture obtained is acid until 168.5 gm. of lime have been added. All the copper is then insoluble and the liquid is neutral without an excess of lime. With quantities of calcium oxid between 168.5 and 225 gm. the mixture is still neutral, the alkalinity after each addition slowly disappearing, but after the addition of 225 gm. the mixture is distinctly alkaline.

The reaction between the lime and the copper sulphate is deemed a rather complex one. The author claims that a basic copper sulphate, a double hydrate of copper and calcium, a double sulphate of copper and calcium, and a tetra-, a penta-, and a deca-copper sulphate are formed, the formation of the latter being dependent on the quantity of lime used. The tetra-copper sulphate is the active fungicide. The quantity of lime necessary to precipitate the copper was found to be less than that recommended by most investigators.

See also a previous note (E. S. R., 33, p. 449).

Technical methods of chemical analysis, edited by G. Lunge et al., trans. and edited by C. A. Keane et al. (*London: Gurney & Jackson, 1914, vol. 3, pts.*

1, pp. XXXI+538, figs. 63; 2, pp. XVI+539–1125, figs. 35).—This is volume 3, parts 1 and 2, of the work previously noted (E. S. R., 27, p. 609). Among the subjects considered are mineral oils; lubricants; oils, fats, and waxes; special methods of analysis employed in the oil and fat industries; resins, balsams, and gum resins; drugs and Galenical preparations; essential oils; tartaric acid; citric acid; organic preparations; India rubber and rubber goods; vegetable tanning materials; leather; ink; sugar; starch and dextrin; alcohol, potable spirits, and liqueurs; vinegar; wine; brewing materials and beer; paper; textile fibers; and inorganic colors.

The application of the paper pulp filter to the quantitative estimation of calcium and magnesium, S. L. Jodidi and E. H. Kellogg (*Jour. Franklin Inst., 181 (1916), No. 2, pp. 217–232, fig. 1*).—From their investigations the authors conclude that the use of the paper pulp filter is superior to ordinary paper filtration, both in point of time and ease of manipulation. Experimental data indicate that as great accuracy is possible with the pulp filter as with standard filter paper.

Differential iodimetry.—I, Determination of periodates, iodates, bromates, and chlorates in the presence of each other, O. L. Barnebey (*Jour. Amer. Chem. Soc., 38 (1916), No. 2, pp. 330–341, figs. 2*).—As a result of his studies the author has found that "(1) certain oxidizing agents can be determined in the presence of each other iodimetrically in a differential manner by regulation of the concentration of reagents, especially the acidity, the temperature, and the time of reaction. (2) Periodate reacts completely with iodid in saturated boric acid solution containing sufficient borax to diminish the acidity to a slight extent, forming iodate and free iodin. (3) Iodate is acted on by tenth-normal iodid in fourth-normal acetic acid solution and the free iodin can be titrated. (4) In fifth-normal hydrochloric acid solution containing tenth-normal iodid, bromate is completely decomposed and the free iodin can be titrated. (5) Sixth-normal hydrochloric acid acting in presence of tenth- to fifth-normal iodid decomposes chlorate completely. After rendering the solution alkaline and then acidifying, the iodin can be titrated with thiosulphate. (6) By combination of (2), (3), (4), and (5), periodate, iodate, bromate, and chlorate can be determined differentially in the presence of each other and in the presence of perchlorate."

A simple hydrogen electrode, H. P. Barendrecht (*Biochem. Jour., 9 (1915), No. 1, pp. 66–70, figs. 2*).—The author describes a simple arrangement for the determination of the true reaction of liquids as an improvement on the electrometric titrating apparatus described by Walpole.[a] Instantaneous and accurate estimations can be made in liquids which contain carbonic acid and oxygen.

A method for the estimation of hygroscopic moisture in soils, W. D. Haigh (*Sci. Proc. Roy. Dublin Soc., n. ser., 14 (1915), No. 40, pp. 529–534, fig. 1*).—A method for determining the hygroscopic moisture in soils is described, which is based on the desiccating effect of calcium carbid. An apparatus is used in which the soil and an excess of calcium carbid are mixed, and the acetylene gas evolved, as a result of the calcium carbid taking up the soil moisture, serves as a measure of the hygroscopic water in the soil.

Comparative tests of this method with the ordinary method of heating in the water oven, using six arable soils and a sand and a peat soil, showed that while the results obtained by both methods agreed quite closely, the amount of water indicated by the carbid method was always slightly lower than that indicated by heating in the oven. The difference increased in a rough proportion to the

[a] Biochem. Jour., 7 (1913), No. 4, pp. 410–428.

hygroscopic moisture present. "The increased hygroscopic moisture present was due almost entirely to an increase in organic material or humus. In the case of a pure peat the difference is as much as 1.5 per cent, while in a sand with no organic matter the results agree. It would appear from this that when a soil contains much organic material the loss of weight on heating to 100° C. represents more than the hygroscopic moisture present in the soil, part of the loss being made up of other volatile constituents which are driven off on heating."

On the basis of these results the carbid method is considered to be a rapid and reliable means for estimating the hygroscopicity of soils.

A note on the Hopkins-Cole reaction for protein, H. G. D. BREIDAHL (*Biochem. Jour., 9 (1915), No. 1, pp. 36, 37*).—Of the materials tried in an effort to reduce the amount of oxidizing agents in fresh sulphuric acid and consequently to give the best color in the ring produced, granulated zinc was found to be the most practical for large quantities of acid.

Modified Wohlgemuth method for the determination of amylase activity in the presence of alkaloids, J. BODNÁR (*Kisérlet. Közlem., 18 (1915), No. 2, pp. 367–372*).—The original procedure (E. S. R., 20, p. 208) has been modified in that the alkaloids which had been found to interfere with the color changes are removed by extraction, after the reaction is complete, with a suitable organic solvent. The alkali is then neutralized with hydrochloric acid and the determination completed in the usual manner.

Bacteriological methods in food and drugs laboratories with an introduction to micro-analytical methods, A. SCHNEIDER (*Philadelphia: P. Blakiston's Son & Co., 1915, pp. VIII+288, pls. 6, figs. 87*).—As stated in the preface, the volume is primarily intended as a guide to students who are interested in the bacteriological examination of foods and drugs. Practical laboratory methods for food examination are outlined and discussed.

Investigations in regard to the determination of the starch content of potatoes, H. J. F. DE VRIES (*Verslag. Landbouwk. Onderzoek. Rijkslandbouwproefstat. [Netherlands], No. 18 (1915), pp. 1–82, pls. 3*).—As indicated by experimental data the specific gravity is not a reliable index to the starch content of potato flours, a chemical analysis being the only means of determining the true starch content. In manufacturing establishments where no laboratory is available and the specific gravity method must be resorted to, the author recommends the use of new tables for the determination of the starch content from the specific gravity, and he prefers the Reinmann or Parow balance to the Stohman method.

The most accurate value for the starch content of a potato flour is found by an indirect analysis, as follows: 100— (moisture at 120° C.+ash+soil material+ether extract+protein+pentosans). Lower values, however, for the starch content are obtained on the average by the Baumert-Bode and Ewers methods than by indirect analysis, as on dissolving the starch according to Baumert and Bode and Ewers, products which reduce Fehling's solution are formed. The method of Ewers is recommended.

Chemical testing of milk and cream, R. H. SHAW (*U. S. Dept. Agr., Bur. Anim. Indus. Doc. A–7 (1916), pp. 38, figs. 31*).—This bulletin contains detailed descriptions of methods for the determination of fat, total solids, specific gravity, acidity of milk and cream, calculation of total solids by formula, and the detection of preservatives. A list of chemicals and apparatus used in the chemical analysis of milk and cream is appended. The subject matter is treated in such a manner that it may be followed by those who have had neither chemical training nor a course in milk testing.

Determination of the quantity of fat in cream, L. LINDET (*Compt. Rend. Acad. Agr. France, 1 (1915), No. 11, 340–346; abs. in Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases, 6 (1915), No. 8, p. 1113, 1114*).—After pointing out the difficulties incident to present methods of determining the quantity of fat in cream, the author describes a method which consists in placing a drop of cream on a piece of foolscap paper, which is then kept at a temperature of 105° C. for two hours. The area of the spot that is thus produced is measured and compared with standards which have been previously prepared with butter fat and treated in an identical manner. A comparison of the method with the desiccation and ether extraction methods indicated a close agreement in analytical results.

The colorimetric determination of acetylene, E. R. WEAVER (*Jour. Amer. Chem. Soc., 38 (1916), No. 2, pp. 352–361, figs. 2*).—In the course of an investigation upon the determination of small amounts of water by the use of calcium carbid the author has devised a colorimetric method for the detection of small amounts of acetylene.

The gas to be investigated is passed into an ammoniacal solution of cuprous chlorid, containing gelatin and alcohol, and the resulting red colloidal solution compared with a suitable standard, such as a solution of a red dye or a piece of ruby glass. The method is deemed very sensitive, it being possible to detect amounts as small as 0.03 mg. of acetylene. Hydrogen sulphid and large amounts of carbon dioxid and oxygen interfere with the determination, but these may be removed, without loss of acetylene, by passing the gas to be tested through a hot alkaline solution of pyrogallol. Several applications of the method are described.

The results as to the determination of water were not satisfactory.

Report of the bacteriologist, W. GILTNER (*Michigan Sta. Rpt. 1915, pp. 208, 209*).—Analyses of a vinegar prepared from maple sap skimmings and of the brine from a normal fermentation of brine pickles are reported. It is concluded that "a vinegar with very good flavor and quality may be produced from maple skimmings or from maple sap at reasonable cost."

Preliminary bulletin on canning, A. W. BITTING (*Nat. Canners Assoc. Bul. 4 (1915), pp. 65*).—This is preliminary to a publication which will give a more complete treatment of the subject of canned foods. The minimum requirements necessary for successful results in the canning of various fruits and vegetables are outlined. Analytical and other data obtained in canning experiments are submitted.

Experimental work on soda cellulose, S. D. WELLS (*Paper, 17 (1915), No. 4, pp. 14, 15, fig. 1*).

METEOROLOGY.

Problems and results of agricultural meteorology, V. K. GAUER (*Trudy Selsk. Khoz. Met., No. 14 (1915), pp. 81–119*).—The more important contributions to this subject are reviewed in this article.

Meterological observations at the Massachusetts Agricultural Experiment Station, J. E. OSTRANDER and D. POTTER (*Massachusetts Sta. Met. Buls. 325, 326 (1916), pp. 4 each*).—Summaries of observations at Amherst, Mass., on pressure, temperature, humidity, precipitation, wind, sunshine, cloudiness, and casual phenomena during January and February, 1916, are presented. The data are briefly discussed in general notes on the weather of each month.

[Meterological observations], D. A. SEELEY (*Ann. Rpt. Sec. Bd. Agr. Mich., 54 (1915), pp. 175–186*).—Daily and monthly summaries of temperature (maximum, minimum, and mean), precipitation, cloudiness, and sunshine, and

monthly summaries of pressure (maximum, minimum, and mean), wind movement, and miscellaneous phenomena (frost, hail, thunderstorms, fog, auroras, and halos) at East Lansing, Mich., are given for the year ended June 30, 1915.

Climatology [of Quebec], J. L. DECARIE (*Statis. Year Book, Quebec, 1915, pp. 118–128, figs. 3*).—The temperature and precipitation during 1914 and preceding years are shown in tables and diagrams and the general characteristics of the climate of the Province are briefly described.

It is shown that climatologically the Province may be divided into three sections; the first, extending from Gaspé to Rimouski, which is very damp on account of proximity to the Atlantic Ocean, with a temperature varying from —30 to 80° F. and a crop season from May 30 to October 15; the second, lying between Rimouski and Three Rivers, with a temperature varying from —30 to 90° F. and a crop season from May 15 to November 1; and the third, covering the territory from Three Rivers westward to the boundaries of the Province, with a temperature varying from —27 to 93° F. and a crop season from April 20 to November 20.

The climate is, on the whole, continental and winter passes rapidly into summer and vice versa. "Life awakens with an outburst of vegetation in the forest after a long winter and almost as abruptly, after a short but delightful autumn, plants begin their slumber. The entire cycle for the flora is accomplished in from five to seven months, from May to the first fortnight of November. When snow falls at the beginning of December it does not melt and it hardens gradually. By means of such a protective covering plants are sheltered from the frost which threatens them in a less severe climate; snow shelters even houses from cold. [It also] keeps the ground warm in winter and fertilizes it." The climatic conditions, in spite of their severity, are stated to be favorable to the growth of cereals, forage plants, roots, or fruits, and for stock raising.

Temperature inversions in relation to frost, A. MCADIE (*Ann. Astron. Observ. Harvard Col., 73 (1915), pt. 2, pp. 168–177, pls. 4; Sci. Amer. Sup., 81 (1916), No. 2095, pp. 140–142, figs. 3*).—This article in large measure covers the same ground as that of a paper previously noted (E. S. R., 34, p. 319). Special emphasis is laid upon the importance of the mixing of air and the relation of air drainage to frost formation.

Influence of the principal meteorogical factors on winter rye, R. G. ZALENSKIĬ (*Trudy Selsk. Khoz. Met., No. 14 (1915), pp. 48–63, figs. 6*).—The results of seven years' observations at the Bogoroditsky Agricultural College on the influence of precipitation and temperature on the growth and yield of winter rye are summarized. The general conclusion is that the best distribution of spring and summer precipitation and of temperature is as follows: Abundant precipitation and heat before the formation of heads; cool and damp weather during the formation of heads; dry and moderate temperature during the time of blooming; and moist and warm weather during the ripening period.

Physical conditions in sphagnum bogs, G. B. RIGG (*Bot. Gaz., 61 (1916), No. 2, pp. 159–163*).—From an analysis of data reported by Cox in a bulletin of the Weather Bureau dealing with frost and temperature conditions in the cranberry bogs of Wisconsin (E. S. R., 26, p. 514), the author concludes that the temperature conditions in both soil and air are less favorable for plants in bogs than on neighboring firm land, and still less favorable in sphagnum moss than in bare peat. As far as relative humidity is concerned, the conditions are less favorable for transpiration on a bog than on neighboring firm land.

Smoke as a source of atmospheric pollution, W. F. M. GOSS (*Jour. Franklin Inst., 181 (1916), No. 3, pp. 305–338, figs. 5*).—This article summarizes the more

important results of general interest obtained in six years' investigations of conditions in Chicago, more particularly with reference to recommending means of smoke abatement. The article also reviews the more important literature of atmospheric pollution, and the methods employed are described.

The investigations showed that "in general, the combination of meteorological conditions which tends to intensify the effects of polluting substances in the air includes low wind velocity, comparatively low temperature, high relative humidity, and absence of sunshine." It was found that the quantity of solid materials, derived both from fuel consumption and from dust, in the atmosphere of Chicago varied from 0.321 to 1.958 mg. per cubic meter. The suspended matter in the air consisted not only of solid products of combustion but also of mineral, vegetable, and animal débris. While the amount and character of the solids in smoke varied greatly, smoke arising from solid fuels was never free from such solids, and, moreover, the amount discharged had no direct relation to visibility. The amount of carbon dioxid found did not vary materially from that of the air of other cities. The ammonia content of the air was small and only insignificant amounts of chlorin were found. The amount of sulphur compounds varied from 0.217 to 1.104 mg. per cubic meter.

Sulphur dioxid content of the atmosphere of the smoke zone [of the Selby smelter, California], J. A. HOLMES, E. C. FRANKLIN, and R. A. GOULD (*U. S. Dept. Int., Bur. Mines Bul. 98 (1915), pp. 26–39*).—The results of 4,862 determinations of sulphur dioxid at two stations, selected with a view to obtaining the maximum sulphur dioxid content of the air in the smoke zone of the Selby smelter in Contra Costa County, Cal., are reported and discussed with reference to the question as to whether the sulphur dioxid constituted a nuisance as regards objectionable odor or effect upon the mucous membrane linings of the throat and lungs of human beings and domestic animals.

The maximum content of SO_2 found during eight months' observations was 7.1 parts per million. This was found, however, under exceptional conditions. The average content calculated from all observations was 0.22 parts per million, and the average for conditions considered favorable for high concentration was 3.6 parts per million. The sulphur dioxid content of the air of a number of California cities and other places outside of the smelter zone is reported for comparison, and shows a considerable percentage of sulphur dioxid in places where no smelters or works of similar character exist. For example, it was found that under certain conditions the sulphur dioxid content of the air of San Francisco reached nearly 2 parts per million.

Considering the data as a whole, the conclusion is reached that the sulphur dioxid content of the smoke zone of the smelter is not sufficient to constitute a nuisance from the standpoint of its direct effect upon man.

Investigations to determine the extent of the contamination of the atmosphere in the Selby "smoke zone" by the smelter emanations, A. E. WELLS (*U. S. Dept. Int., Bur. Mines Bul. 98 (1915), pp. 82–212, pls. 4, figs. 5*).—This is a detailed account of methods employed and the results observed in the investigations of which the more general results are summarized in the article noted above.

SOILS—FERTILIZERS.

A student's book on soils and manures, E. J. RUSSELL (*Cambridge, England: Cambridge University Press, 1915, pp. IX+206, figs. 34*).—This number of the Cambridge Farm Institute series is a rather popular treatise on soil management which is divided into three parts.

Part 1 deals with the soil itself with reference to the requirements of plants, soil composition, soil organic matter and the changes it undergoes, and the effect of climate on soil and soil fertility. Part 2 deals briefly with soil control by means of cultivation and by determining and overcoming the factor or factors limiting crop growth. Part 3 deals with fertilizers, taking up in turn nitrogenous, phosphatic, and potassic fertilizers; organic manures, including barnyard manure; the purchase and use of artificial manures; and chalk, limestone, and lime. An appendix describing methods of soil analysis, and a bibliography, are also included.

Soil survey of Limestone County, Alabama, R. T. A. Burke and A. M. O'Neal, Jr. (*U. S. Dept. Agr., Advance Sheets Field Operations Bur. Soils, 1914, pp. 41, fig. 1, map 1*).—This survey, made in cooperation with the State of Alabama and issued January 12, 1916, deals with the soils of a well-drained area of 373,760 acres in northern Alabama, comprising uplands and first and second river terraces. With the exception of some rough land in the Elk River basin and small swampy areas, the topography is considered favorable to economical crop production.

The soils are of residual and alluvial origin. Sixteen soil types of ten series are mapped, of which the Clarksville silt loam covers 31.3 per cent of the area, the Decatur clay loam and silt loam 15.5 and 11.8 per cent, respectively.

Soil survey of Columbia County, Arkansas, C. Lounsbury and E. B. Deeter (*U. S. Dept. Agr., Advance Sheets Field Operations Bur. Soils, 1914, pp. 38, fig. 1, map 1*).—This survey, made in cooperation with the Arkansas Experiment Station and issued February 16, 1916, deals with the soils of an area of 496,000 acres in the Coastal Plain province in southern Arkansas, the topography of which is gently rolling to rolling. "The drainage is usually adequate in the more rolling areas, but in the lower and flatter areas . . . artificial drainage is needed."

The soils are primarily of sedimentary origin. Including meadow, 27 soil types of 11 series are mapped, of which the Susquehanna fine sandy loam covers 21.2 per cent, the Caddo fine sandy loam 17.5 per cent, and the Ocklocknee very fine sandy loam 13.2 per cent of the area.

Soil survey of Putnam County, Florida, C. N. Mooney, B. D. Gilbert, H. W. Hawker, and W. B. Cobb (*U. S. Dept. Agr., Advance Sheets Field Operations Bur. Soils, 1914, pp. 52, pl. 1, fig. 1, map 1*).—This survey, issued February 15, 1916, deals with the soils of an area of 468,480 acres in northern Florida. The county comprises extensive areas of low, level flatwoods in the eastern and central sections and rolling upland areas in the western part. Drainage is poorly established, being effected largely by seepage.

"The soils of the county range widely in topographic position and drainage conditions from high, rolling, excessively drained soils to swamps and filled-in lakes. They range in texture from sand to clay. There are also cumulose deposits forming peat and muck." Twenty-four soil types of 10 series are mapped, of which the Norfolk fine sand covers 25.4 per cent, the Portsmouth fine sand 19.3 per cent, muck 11.5 per cent, the Norfolk sand 11.4 per cent, and the Leon fine sand 11.2 per cent of the area.

Soil survey of Nemaha County, Nebraska, A. H. Meyer, M. W. Beck, E. H. Smies, R. R. Burn, L. T. Skinner, and W. A. Rockie (*U. S. Dept. Agr., Advance Sheets Field Operations Bur. Soil, 1914, pp. 38, fig. 1, map 1*).—This survey, made in cooperation with the Nebraska Soil Survey and issued February 24, 1916, deals with the soils of an area of 257,280 acres in southeastern Nebraska which lies in the glaciated part of the Great Plains province. The topography ranges from almost flat to rough and extremely dissected.

The soils of the county are divided into upland soils of glacial and loessial origin, alluvial terrace soils, and first bottom soils derived from recent stream deposits. Twelve soil types of eight series are mapped, of which the Carrington, Marshall, and Wabash silt loams cover 42.3, 24, and 19.7 per cent of the area, respectively. The soils of the county are dark in color and rather high in organic matter content.

Soil survey of Oneida County, New York, E. T. Maxon, M. E. Carr, and E. H. Stevens (*New York Cornell Sta. Bul. 362 (1915), pp. 59, pls. 2, figs. 2*).—This survey has been noted from the Field Operations of the Bureau of Soils of this Department for 1913 (E. S. R., 34, p. 123).

The soils and agricultural development of the Mohawk Valley, E. O. Fippin (*Cornell Countryman, 13 (1915), No. 3, pp. 203–206, figs. 2*).—This article briefly discusses the general characteristics of the soils of an area in New York which occurs as a deep, broad trough between the Catskill and Adirondack Mountains. The soils are of igneous, limestone, and shale origin and are said to vary widely in productivity.

Analyses of soils of different localities in the Belgian Congo, M. G. Batz (*Bull. Agr. Congo Belge, 5 (1914), No. 4, pp. 601–629*).—Physical and chemical analyses of 36 samples of soil from seven different districts of the Belgian Congo are reported and briefly discussed.

Experiments at Oxford on the analysis of Belgian Congo soils, E. Leplae (*Bul. Agr. Congo Belge, 5 (1914), No. 4, pp. 630–654, figs. 15*).—Nine series of pot culture experiments with Belgian Congo soils, which were so arranged as to indicate the nutritive constituents relatively in minimum in the soils, showed that these soils are lacking in nitrogen and available phosphoric acid. These results are compared with chemical analyses of the same soils, showing the defects in ordinary methods of chemical soil analysis for indicating the fertilizer needs of these soils. Further studies to perfect methods of chemical analysis are in progress.

A study of nitrification in Philippine soils, E. H. Pañganiban (*Philippine Agr. and Forester, 4 (1915), No. 4, pp. 81–91*).—Nitrification experiments, using ammonium sulphate and dried blood, on yautia, corn, banana, and cogon soils and on a nursery soil, and experiments with the same soils on the influence on nitrification of calcium carbonate, magnesium carbonate, and sand, and of varying the soil moisture content are reported.

Different soils, although similar chemically, showed different rates of nitrification. A part of this difference is attributed to the influence of the present and preceding crops on the bacterial flora of the soil. Some soils originally in cogon grass that had grown crops continuously for three years gave a low rate of nitrification amounting to from 5.55 to 7.84 mg. in a 100-gm. sample of soil during four weeks' incubation at room temperature, in the presence of 16.34 mg. of nitrogen as dried blood. Two plats tested that had been but recently brought under cultivation gave a much more rapid rate of nitrification, amounting to from 8.27 to 14.71 mg. under the same conditions. The nitrification with ammonium sulphate was about 50 per cent more rapid than that with dried blood. Lime applied at the rate of 15 tons per hectare (about 6 tons per acre) increased the rate of nitrification by more than half, while rapid evaporation during the time of incubation lowered the rate a great deal, and the addition of 25 per cent sand to clay soil increased it as much as 80 per cent. By sterilizing the soil with heat, nitrification was almost entirely suppressed, even though the soil was afterwards reinoculated. Magnesium carbonate interfered with nitrate formation to as much as 40 per cent and caused nitrites to accumulate in the soil.

These results are taken to indicate that the soils should be limed, but that the calcium carbonate should contain as little magnesium carbonate as possible. Dried blood is considered preferable to ammonium salts as a fertilizer. It is recommended that optimum moisture conditions (20 to 40 per cent moisture) be maintained in the soil, that surface cultivation be frequent, and that cogon lands be not burned off.

Nitrogen content of the humus of arid soils, F. J. ALWAY and E. S. BISHOP (*U. S. Dept. Agr., Jour. Agr. Research, 5 (1916), No. 20, pp. 909–916*).—In this contribution from the Minnesota Experiment Station, the work of others bearing on the subject is briefly reviewed, methods of humus nitrogen determination in soils are discussed, and the results of determinations of humus and humus nitrogen in 16 virgin and cultivated arid California soils, made by the authors in 1911 while at the Nebraska Station, are reported.

"Of the 16 samples only five show as high as 10 per cent of nitrogen in the humus. For the 6 samples of virgin soil the average is 8.5 per cent, with a maximum of 12 and a minimum of 4 per cent. For the 10 of cultivated soils the corresponding data are 8.1, 11.8, and 5.6 per cent, respectively. The maximum possible percentages of nitrogen in the humus—the relation of the total nitrogen to the humus—ranged from 5.5 to 19.6 per cent, with an average of 13.1." These results are taken to "confirm the work of Hilgard that high percentages are to be found in the arid, but not in the humid soils. This high nitrogen content of the humus, however, does not appear so general in the arid soils as to serve as an at all reliable means of identification."

Investigations on ammonia adsorption by soil, L. PINNER (*Kühn Arch., 6 (1915), pt. 1, pp. 153–238, figs. 5; abs. in Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases, 6 (1915), No. 10, pp. 1304, 1305*).—The history and theory of the adsorption of gases by soils and other materials are reviewed in some detail, and experiments with a number of German soils and with red soils from other countries are reported. The purpose was to determine the adsorptive power of the soils for ammonia when treated with ammonia solution, gaseous ammonia, and ammonium chlorid solution. The ammonia adsorption was determined gravimetrically and volumetrically. Parallel experiments were conducted with charcoal and permutite.

It was found that no conclusive parallelism existed between ammonia adsorption and the mechanical and chemical properties of the soils. The ammonia adsorption values for the native soils were parallel to their hygroscopicity values. The red soils showed a wider and more irregular relation between hygroscopicity and adsorption of gaseous ammonia. Ammonia adsorption by soils was similar to that by charcoal. The greatest gas adsorption occurred within a few minutes and became constant only after some hours. Ammonia adsorption was greater by soils retaining some hygroscopic moisture than by dried soils, but not as great as by dried soils and water together. Part of the adsorbed ammonia gas was retained by the soils even when aerated for some weeks. While certain relations existed between the adsorption of ammonia from ammonia solution or ammonium chlorid solution and the adsorption of gaseous ammonia, no parallelism was proved. Ammonia adsorption by soil from ammonium chlorid and from ammonia solution also differed. An increase in the quantity of ammonium salt solution used caused a decrease in ammonia adsorption by all the soils.

It is concluded that ammonia adsorption varies considerably on account of the complex nature of the soil, thus practically preventing the formation of a theory applicable to all kinds of soils. However, the Freundlich theory that adsorption is a surface condensation process is considered the most probable.

The alkaline reaction produced in soils by acids in relation to plant nutrition.—I, Solubility of iron compounds in the soil, G. Masoni (*Staz. Sper. Agr. Ital., 47 (1914), No. 9–10, pp. 674–701; abs. in Chem. Zentbl., 1915, I, No. 10, p. 498; Chem. Abs., 9 (1915), No. 13, p. 1816*).—Experiments based in part on results noted in a previous study (E. S. R., 30, p. 122) are reported. The dissolving power of hydrochloric, nitric, sulphuric, phosphoric, formic, acetic, oxalic, succinic, malic, tartaric, and citric acids and of potassium sulphate, monopotassium phosphate, monopotassium oxalate, monosodium tartrate, and monopotassium citrate, when used in twentieth-normal, fiftieth-normal, and in normal solutions were observed on the iron compounds in a calcareous soil, with and without additions of ferric and ferrous salts and with and without the presence of carbon dioxid. The processes involved both direct mixing and percolation.

The dilute solutions of all the acids, excepting citric, tartaric, and malic acids, failed to throw iron into solution from the soil alone, and even when ferrous and ferric salts had been added. Dilute citric acid dissolved considerable iron under all conditions and tartaric and malic acids relatively less, as did also the solutions of their corresponding salts. The reaction was, however, always for ferrous iron. The presence of relatively large quantities of carbon dioxid did not modify the results. Similar experiments made with pure calcium carbonate yielded similar results.

The normal solutions of the acids and acid salts in practically every case dissolved iron in a more or less marked degree.

The results of these experiments are considered to throw more or less light on the cause of chlorosis in plants growing in limestone soils, in that the weak acids from plant roots act in the same manner as the weak acids noted above. This results in the iron compounds being precipitated in insoluble form.

Soil moisture investigations (*Washington Sta. Bul. 127 (1915), pp. 15–20, figs. 3*).—The results of three seasons' investigations on the water requirements of seven of the more important crops are given in the following table. "Moisture determinations were made to a depth of 10 ft. at time of planting and at harvest on both cropped and check plats. . . . The difference between the cropped and check plats is what was taken by the crops."

Yield and water requirements of crops.

Crop.	Yield, average 3 years.		Ratio of grain to straw.	Water loss.			
	Grain.	Straw.		Transpiration.	Evaporation.	Rainfall.	Total.
	Bushels.	*Tons.*		*Acre-inches.*	*Acre-inches.*	*Acre-inches.*	*Acre-inches.*
Wheat	44.2	1.86	1 : 1.45	12.75	3.36	3.30	19.41
Oats	85.0	1.72	1 : 1.27	9.95	2.47	3.30	15.72
Barley	48.4	1.64	1 : 1.50	8.80	2.00	3.30	14.10
Corn	33.4	1.88	1 : 1.61	3.72	2.36	3.15	9.23
Peas	31.5	1.27	1 : 1.34	7.33	1.82	3.30	12.45
Beans	9.7	.51	1 : 1.75	3.47	2.57	3.15	9.19
Millet	....	2.75	....	6.54	1.92	2.45	10.91

In an attempt to ascertain whether there is any variation in the distribution of nitrates at relatively small distances in soil, a cubic yard of soil so laid off that a sample was taken every 4 in. parallel to the faces of the cube, making in all 1,000 samples. Analyses of these for nitrate content showed that "the samples containing more than 10 parts of nitrates per million of dry soil

constituted 1.1 per cent of the total number of samples taken and their total nitrate content was approximately 10 per cent of the total nitrate as contained in all samples."

Studies on the influence of cultivation on nitrate development in 11 tenth-acre plats of silt loam soil showed that the highest nitrate content was found in early spring. Two months later there was only a small amount left, but it was in the same proportion as in April and at harvest time there was still less. In November, two and one-half months after harvest there was a slight increase but not until the fall rains came was there a very material development. The following spring there was a marked increase in those plats which were fall plowed.

Duty of water experiments at the Grandview substation on corn and potatoes during a season with a rainfall of 7.35 in. gave results showing that the yield of corn per acre was greatest with an 8-in. application of water, followed in order by 4, 12, 20, and 16 in. applications. The yield per acre-inch of water applied, however, decreased steadily as the size of application increased. The yield of potatoes per acre increased as the application increased from 4 to 21 in., while the yield per acre-inch decreased as the application increased.

A study of the percolation of water in coarse sand, medium sandy loam, and fine sandy loam showed that the absorptive power of the soil gradually decreases "as the time increases with the application of water."

The water-supplying power of the soil as indicated by osmometers, H. E. Pulling and B. E. Livingston (*Carnegie Inst. Washington Pub. 204 (1915), pp. 49–84, figs. 2*).—Preliminary experiments on the power of an artificial soil mixture, consisting of 3 parts of sand and 1 part of dry loam, to supply water to the roots of plants, as indicated by osmometers prepared from ordinary thistle tubes with the large opening closed by a collodion membrane, are reported. Cane sugar solution was used in these osmotic cells. The osmometers were tested both in water and in the soil mixture. The collodion membranes were found to be suitable for the making of osmotic cells for such experiments.

Packing of the soil was found to be of prime importance in determining its water-supplying power. "The lack of suitable methods for obtaining strictly comparable packing of a number of soil samples is one of the main obstacles to a rapid investigation of the field thus opened."

In this connection it is also considered evident that "it is the percentage of contained soil moisture on the basis of actual soil volume, and not this percentage calculated on dry weight of the soil, which plays an important part in determining the efficiency of the soil as a source of water supply to growing plants. . . . The influence of temperature upon the water-supplying power of the soil, or at least upon its measurement, appears to be of great importance."

It was further found that the osmotic solution used (5-weight molecular cane sugar) was too concentrated to permit the measurement of the water-supplying power of the soil mixtures with the water content much above their critical optimum. Below the critical moisture content the tests gave quite satisfactory results. "Of fundamental interest is the fact that the critical point in soil-moisture content appears to be approximately the same as that emphasized as the critical optimum water content by workers in other lines of soil physics."

The freezing point method as a new means of measuring the concentration of the soil solution directly in the soil, G. J. Bouyoucos and M. M. McCool (*Michigan Sta. Tech Bul. 24 (1915), pp. 44, figs. 2*).—This bulletin reports the details of experiments previously noted (E. S. R., 34, p. 419). In addition to the results noted in the previous report it was found that, at the low moisture

content, the lowering of the freezing point of soils is very high and varies considerably with the extreme types of soil, being highest in clay and lowest in sand.

"In all the soils, with the exception of quartz sand and some extreme types of sandy soil, the ratio of the lowering of the freezing point is not directly inversely proportional to the ratio of the water content . . . but the former is many times greater than the latter. . . . By determining the lowering of the freezing point of various soils at a large number of moisture contents it was found that . . . the lowering of the freezing point increases in a geometric progression while the water content decreases in an arithmetic progression. In the case of quartz sand and some extreme types of sandy soil, however, the depression of the freezing point increases inversely proportional with the water content. . . . All evidences, both direct and indirect, point to the fact that high depressions of the freezing point are produced by and represent actual concentration. . . . The rate of increase in the lowering of the freezing point with the decrease in moisture content is uniform throughout, from the maximum to the minimum moisture content, etc."

Further experiments with washed quartz sand, silt loam, clay, sandy loam, humus loam, peat, and kaolin to determine, by means of the freezing point method, the influence of adding tenth-normal solutions of potassium chlorid, potassium sulphate, magnesium sulphate, ammonium sulphate, calcium nitrate, sodium nitrate, potassium phosphate, calcium phosphate, and sodium phosphate to the soils, showed that "in the case of the neutral salts the concentration of the soil solution was increased from 20 to 100 per cent of their strength employed, while in the case of the soluble phosphates the concentration of the soil solution of all the soils except peat, quartz sand, and kaolin, was extremely little, if any, increased. These results on the whole do not confirm entirely the theories that the application of soluble salts, even in small amounts, may not increase the total concentration of the soil solution."

Changes in soils brought about by heating, A. WILSON (*Sci. Proc. Roy. Dublin Soc., n. ser., 14 (1915), No. 38, pp. 513–520, figs. 3*).—Laboratory experiments are reported in which the depression of freezing points and the electrical conductivities of extracts of soils which had been heated for two hours at from 60 to 150° C. were determined.

It was found that heating increased the amount of soluble matter in soil, this being indicated by a considerable increase in electrical conductivity, a marked depression of the freezing point, and a wide range of coloration of extracts from soil heated at different temperatures. "In each of the extracts about half the depression of freezing point was due to electrolytes. The increase in the amount of water absorbed by the heated soil indicates a change in the texture of the soil brought about by heating. . . .

"The results of these experiments show that at any rate part of the increased productivity of heated soil may be due to the increase in soluble matter induced by heating, and to the change in soil texture, which has a remarkable effect on the retention of water by the soil."

A list of references to literature bearing on the subject is appended.

Soil fertility, J. E. RUSH (*Science, n. ser., 42 (1915), No. 1088, pp. 632–634*).—It is stated that "the problem of soil fertility is a composite one which needs for its solution a knowledge of the interrelated subjects physics, chemistry, and bacteriology." The presence of the proper bacteria in the soil is, however, considered to be the final deciding factor in soil fertility.

Maintaining fertility in the Wisconsin drift soil area in Iowa, W. H. STEVENSON, P. E. BROWN, and L. W. FORMAN (*Iowa Sta. Bul. 161 (1915), pp.*

235–263, figs. 5).—Five series of experiments with corn, oats, and clover on 46 tenth-acre plats and 12 three-twentieth-acre plats of loam soil, to determine the fertility needs of this soil and the influence of rotation and the uses of phosphorus, potassium, manure, and catch crops, are reported. Each series of plats received the following soil treatment: Legume; manure; manure and legume; manure, legume, and phosphorus; legume and phosphorus; manure and phosphorus; legume, phosphorus, and potassium; manure, phosphorus, and potassium; phosphorus and potassium; and phosphorus.

It was found absolutely essential that a definite rotation of crops be followed which contained a legume to be turned under as a green manure or fed to live stock and the manure returned to the land. "Comparison of the yields of corn grown continuously on the same soil for eight years with those secured in the four-year rotation show much greater yields in the latter case. . . .

"The supply of organic matter and nitrogen must be kept up in this soil and the cheapest and best method of accomplishing this is by the use of farm manure. Applications of manure have been shown to bring about considerable increases in crop production, and greater net returns have been secured by its use than with any other fertilizing constituents and in most cases greater yields were obtained. . . .

"Where manure is not produced the organic matter and nitrogen content of the soil must be maintained by the use of leguminous crops, as green manures. When green manuring is practiced care should be taken that no injury to the main crop occurs. Experiments with cowpeas turned under as a catch crop in the corn frequently showed a depression in the yields of corn. . . . Soil and climatic conditions and the particular seasonal conditions must determine the safe use of legumes. Other legumes, like red clover, may be grown as a regular crop in the rotation and only the seed removed, the remainder of the crop being turned under in the fall. . . .

"Phosphorus and potassium . . . at the present time do not appear to be limiting factors in crop production on the Carrington loam. Applications of these materials did not prove profitable on any of the crops grown in the regular rotation, although in some cases small increases in yields were secured. There is an indication that a small amount of a soluble potassium fertilizer might prove of value for clover."

Drainage, cultivation, and liming are also emphasized as important factors in maintaining the fertility of Wisconsin drift soils.

The fertility in Iowa soils, P. E. Brown (*Iowa Sta. Bul. 150, popular ed.* (*1914*), *pp. 5–47, fig. 1*).—A popular edition of Bulletin 150 (E. S. R., 32, p. 211).

Rotation, fertilizer, and manure experiments, V. M. Shoesmith (*Michigan Sta. Rpt. 1915, pp. 229–231*).—The data secured up to date in these experiments with wheat, corn, clover, potatoes, beans, rye, oats, and beets are given in tabular form.

In a corn, wheat, and clover rotation it was found that "the increase in yield from the use of the complete fertilizer and from the phosphorus and potassium fertilizer are about the same, but the net value of the increase is somewhat higher in the case of the latter fertilizer. The net value of the increase is larger from the use of the phosphorus fertilizer than when both nitrogen and phosphorus are used. . . . The yard manure when applied at the rate of 5 tons per acre is shown to be worth $2.77 per ton, while stall manure is worth $3.66 per ton when applied at the rate of 5 tons per acre and $3.17 per ton when applied at the rate of 10 tons per acre. When 200 lbs. of acid phosphate have been applied to the 5 tons of manure a sufficient increase has been secured to pay for the acid phosphate and allow $6.46 per ton for the manure, or nearly twice the value of the untreated manure."

Peculiar plant physiological action of an ammonium fertilization, H. G. SÖDERBAUM (*Meddel. Centralanst. Försöksv. Jordbruksområdet, No. 125 (1915), pp. 13, figs. 2*).—Pot experiments with barley on a sand soil are reported, in which superphosphate, Thomas slag, and bone meal were used in different experiments to supply phosphoric acid, while nitrogen was supplied as ammonium chlorid and ammonium sulphate. The experiments were conducted with and without additions of the sulphate or carbonate of magnesium.

Two or three weeks after germination the plants in pots receiving superphosphate or bone meal and an ammonium salt, but no magnesium carbonate, showed evidences of sickness and stunted growth. This was especially marked in the pots receiving superphosphate. This effect was not observed in the pots receiving Thomas slag, and additions of magnesium carbonate apparently removed the condition. After such treatment the affected plants recovered and rapidly reached normal development.

These results are taken to indicate that the bad effect produced on the plants is due less to the production of a physiologically acid reaction in the soil than to a direct toxic action of the ammonium salts. The favorable action of magnesium carbonate is explained on the grounds that the transformation of the ammonia into nitrates is accelerated.

Some observations on the storing of calcium cyanamid, A. H. BURGESS and D. R. EDWARDES-KER (*Jour. Southeast. Agr. Col. Wye, No. 22 (1913), pp. 363–367; abs. in Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases, 6 (1915), No. 5. pp. 675, 676*).—From the results of a series of experiments the authors conclude that loss of nitrogen from calcium cyanamid exposed freely to the atmosphere is apparently not caused either by moisture or carbon dioxid or by both acting together. When stored in air-tight containers there is no loss of nitrogen and, therefore, the loss noted when exposed to the air is probably caused by some atmospheric agent. A fall in the percentage of nitrogen, owing to the increase of weight, is caused by the absorption of water, but water does not cause any real loss of nitrogen.

The world's supply of potash (*London: The Imperial Institute, 1915, pp. 47; abs. in Nature [London], 96 (1915), No. 2394, pp. 60, 61*).—This pamphlet contains an account of the more important sources of potash in the world, including the Stassfurt deposits in Germany.

It is stated that besides the Stassfurt deposits, the only extensive deposit of carnallite known is that at Catalonia, in Spain. "All plants contain more or less potash, and the utilization of the ash of wood, the ash of seaweed, of beetroot residues, and similar by-products of industries in which vegetable materials are employed, is of importance, . . . especially at a time of scarcity." The ashes of seaweed, waste wood, hedge trimmings, and vegetable refuse, and the waste water from the wool-scouring process are also discussed as promising sources of potash.

The origin, mining, and preparation of phosphate rock, E. H. SELLARDS (*Trans. Amer. Inst. Mining Engin., 50 (1914), pp. 901–916, figs. 3*).—This is a summary of information on the subject, referring especially to the Florida and Tennessee phosphate deposits.

Tennessee phosphate practice, J. A. BARR (*Trans. Amer. Inst. Mining Engin., 50 (1914), pp. 917–933, figs. 12*).—This article briefly describes the geology and mineralogy of the Tennessee phosphate deposits and the methods employed in prospecting, valuation, mining, and treatment, and in the manufacture of acid phosphate.

Sensitiveness of lupines to calcium, T. PFEIFFER and E. BLANCK (*Mitt. Landw. Inst. Breslau, 7 (1914), No. 2, pp. 201–233; abs. in Zentbl. Agr. Chem., 44 (1915), No. 1, pp. 22–25; Jour. Chem. Soc. [London], 108 (1915), No. 630, I,*

pp. 201, 202).—While ground limestone proved to be less injurious to lupines than precipitated calcium carbonate, its effects were found to vary greatly (the yield being increased by limestone in one case), so that no limiting point is indicated. Calcium sulphate was also injurious to lupines, apparently causing them to take up less phosphorus.

Assimilation of iron by lupines was retarded by both limestone and potassium nitrate. It is considered probable that the injurious effects of calcium are due partly to its influence on iron assimilation.

Shall gypsum be used as a fertilizer? D. MEYER (*Illus. Landw. Ztg., 35 (1915), No. 39, p. 267*).—Experiments with clover, mustard, oats, and potatoes on an acid sandy loam soil and a neutral sand soil poor in humus to determine the indirect fertilizing value of gypsum are briefly reported. The results are taken to indicate that gypsum has no indirect fertilizing value and that it can not be considered of value as a lime fertilizer.

The value of by-products rich in lime as compared with slaked lime and ground limestone, H. VON FEILITZEN (*Svenska Mosskulturför. Tidskr., 28 (1914), No. 3–4, pp. 210–215, fig. 1; abs. in Zentbl. Agr. Chem., 44 (1915), No. 4–5, pp. 160, 161*).—Pot experiments with red clover on an undecomposed upland moor soil, poor in lime and reacting acid to litmus, to determine the relative values of so-called basic Martin slag containing 37.52 per cent lime, a coal ash from the iron industry containing 18 per cent lime, slaked lime, and ground limestone, when added at the rate of 2,000 kg. per hectare (1,780 lbs. per acre), are reported.

As good results were obtained with the ground limestone and the coal ash as with slaked lime. The results with the basic slag were much behind those of the other three fertilizers for the first crop, but equaled them for the second crop.

Limestones of New York, with reference to their agricultural use, R. C. COLLISON and J. F. BARKER (*New York State Sta. Tech. Bul. 47 (1915), pp. 3–38, pls. 9*).—This bulletin deals briefly with the stratigraphic position, general locality, approximate thickness, adaptability to agricultural use, and prominent characteristics of the 49 limestone formations found within the State of New York, describes separately and more in detail the more important formations, and reports the results of analyses of a varying number of each. A limestone map is included showing the area of outcrop of each of the more important formations or groups of formations, and two stratigraphical columns are given showing diagrammatically cross sections of the hard-rock geology for the eastern and western halves of the State. A final section briefly discusses types and origin of limestones.

Limestone and marl deposits of South Carolina, F. H. H. CALHOUN (*South Carolina Sta. Bul. 183 (1915), pp. 31, figs. 7*).—This bulletin deals with the origin and practical agricultural uses of limestone, and reports an investigation of the lime-bearing deposits of South Carolina made with special reference to those suitable for a source of ground limestone and marl for agricultural purposes.

As a result of this investigation it is considered doubtful if, even under the best management, the limestone of the Piedmont and mountain sections of the State can be so marketed as to compete with North Carolina and Tennessee products.

It is stated that of the marl deposits of the State "few are found which would encourage further investigation. The most promising deposits . . . are those along the Santee River between Ferguson and Eutawville and near Creston, and the deposits on the Pee Dee, near Godfreys Ferry, and those in the lower part of Berkeley and Dorchester counties."

[Agricultural lime] (*Off. Bul. Ohio Agr. Com., 6 (1915), No. 1, pp. 111–119*).—A list of brands of agricultural lime licensed for sale in Ohio from January 1 to June 10, 1915, is given, together with guarantied analyses.

The fertilizing action of common salt, with special reference to its supposed power to replace potash salts, H. G. SÖDERBAUM (*Meddel. Centralanst. Försöksv. Jordbruksområdet, No. 120 (1915), pp. 26, fig. 1; K. Landtbr. Akad. Handl. och Tidskr., 54 (1915), No. 8, pp. 673–695, fig. 1*).—A historical review of the work along this line is given, and further experiments with sodium chlorid, potassium chlorid, and potassium sulphate on sand and moor soil are reported (E. S. R., 26, p. 623).

The results showed that common salt in the presence of sufficient potash usually caused a marked increase in the oats crop, except where the basal fertilizers contained nitrogen as ammonium chlorid. Common salt was not able to act as a substitute for potash, however, and potassium chlorid alone produced as good results as potassium sulphate and common salt together. The action of potassium sulphate alone was less than when combined with common salt. This is considered to be further proof that the beneficial effect of sodium chlorid is due to the chlorin supplied rather than to the sodium.

Action of free sulphur on vegetation, G. BOSINELLI (*Staz. Sper. Agr. Ital., 48 (1915), No. 3, pp. 175–184; abs. in Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases, 6 (1915), No. 7, pp. 931, 932; Jour. Soc. Chem. Indus., 34 (1915), No. 20, p. 1064; Chem. Zentbl., 1915, I, No. 21, p. 1137*).—Pot and field experiments begun in 1913 with vetch, oats, mustard, corn, beans, and rape to determine the effect of small additions of free sulphur on the yield are reported.

The results of the pot experiments showed that the yields were increased in all cases where sulphur was added, but the increases were not very considerable and not proportional to the quantity of sulphur used. The greatest increase in yield sometimes corresponded to the smallest dressings of sulphur. Determinations of protein did not reveal any influence of sulphur on the formation of albuminoids.

In field experiments the sulphur gave only a very slight increase in crop yield and a decrease in the case of mustard. No evidence was obtained that sulphur has any effect upon chlorophyll formation. Further experiments showed that sulphur accelerates the transformation of organic nitrogen into ammonia compounds, but only to a very limited extent, and the action soon ceases. The usefulness of sulphur in practical farming is considered doubtful.

The utilization of coffee pulp, etc., as manure for tropical crops, R. D. ANSTEAD (*Trop. Life, 11 (1915), No. 7, pp. 124–126*).—Analyses of the dry matter in fresh coffee pulp showed a content of phosphoric acid 0.81 per cent, potash 2.38 per cent, and nitrogen 2.61 per cent. This pulp dry matter is considered as good for fertilizing purposes as the best Indian cattle manure. It is stated that mixing the pulp with lime and allowing the pulp to leach in the pulp pit both cause a loss of fertilizing constituents. Two methods of composting the pulp are described.

Fertilizer inspection (*Maine Sta. Off. Insp. 74 (1915), pp. 225–284*).—This bulletin contains the results of actual and guarantied analyses of 628 samples of fertilizers and fertilizing materials collected in Maine under the fertilizer-inspection law of that State during 1915. These are taken to indicate that "on the whole the fertilizers of 1915 are fairly well up to the guaranty." Brief suggestions regarding how best to meet the fertilizer situation in the State in 1916 are also given.

Farmers' bulletin on fertilizers (*Bul. [Maine] Dept. Agr., 14 (1915), No. 4, pp. 48*).—This bulletin contains the results of actual analyses made at the

Maine Experiment Station of 511 samples of fertilizers and fertilizing materials offered for sale in Maine during 1915, together with their guarantied analyses.

[Analyses of fertilizers and cotton-seed meal], B. W. KILGORE ET AL. (*Bul. N. C. Dept. Agr., 36 (1915), No. 11, pp. 85*).—This bulletin contains the results of the actual and guarantied analyses and valuations of 1,376 samples of fertilizing materials, collected in North Carolina during the fall months of 1914 and the spring months of 1915, and of 109 samples of cotton-seed meal.

Analyses and valuations of commercial fertilizers (*Off. Bul. Ohio Agr. Com., 6 (1915), No. 2, pp. 14–56*).—Actual analyses made at the Ohio State University of 518 samples of fertilizers and fertilizing materials offered for sale in Ohio during 1914 are reported, together with their guarantied analyses.

[Commercial fertilizers] (*Off. Bul. Ohio Agr. Com., 6 (1915), No. 2, pp. 61–97*).—This section contains a list of brands of fertilizers licensed in Ohio from January 1 to July 1, 1915, statements covering valuations of commercial fertilizers, and the results of actual analyses made by the Ohio State University of 218 samples of fertilizers and fertilizing materials offered for sale in Ohio during 1915.

AGRICULTURAL BOTANY.

Methods in plant histology, C. J. CHAMBERLAIN (*Chicago: Univ. of Chicago Press, 1915, 3. rev. ed., pp. XI+314, figs. 107*).—This book, which is now in its third edition (E. S. R., 13, p. 425) embodies a considerable number of additions and improvements in technique so that the present volume is practically a new work.

[Report on physiological and pathological studies with plants], G. HÖSTERMANN (*Ber. K. Gärt. Lehranst. Dahlem, 1913, pp. 52–77, figs. 5*).—This report mentions studies carried forward on certain diseases of economic plants, on electroculture, etc., and deals more in detail with the development of root systems by plants in relation to given soils. It discusses also some studies on parthenocarpy in tomato and other plants, and plant breeding in relation to withstanding disease and winter cold.

The pollen-presentation mechanism in the Compositæ, J. SMALL (*Ann. Bot. [London], 29 (1915), No. 115, pp. 457–470, figs. 9*).—The author claims that the hypothesis that the appendages of the style branches and the apical and basal appendages of the anthers are expressions of a tendency to economy of pollen, which is limited only by the biological necessity of providing sufficient pollen to insure fertilization, is supported by evidence in the shape of correlative development of these appendages. Tables are given showing the relative frequency of occurrence of the different types of styles and stamens in the various tribes and the lines of development and specialization in the pollen-presentation mechanism. A bibliography is included.

A quantitative examination of the elements of the wood of trees in relation to the supposed function of the cells in the ascent of sap, H. H. DIXON and MISS E. S. MARSHALL (*Sci. Proc. Roy. Dublin Soc., n. ser., 14 (1915), No. 29, pp. 358–368*).—In order to test the conclusions arrived at by Janse (E. S. R., 32, p. 221), the authors have made some measurements on the structure of the conducting tracts of several trees, and the bearing of these on the hypothesis put forward by that author is discussed. The results as shown are claimed to lend no support to the hypothesis of Janse as to the intervention of the living cells in the ascent of sap in stems.

Formation of nodules, W. GILTNER and C. W. BROWN (*Michigan Sta. Rpt. 1915, pp. 206, 207*).—A brief account is given of a study of some of the factors influencing the development of root tubercles on leguminous plants.

It was found that on the roots of beans, peas, clovers, vetches, and others, newly formed nodules were present when the plants were from three to six weeks old. Perennial plants may exhibit nodules at any time when there is renewed activity in the root system. The life of a nodule was found to be influenced by a number of factors. In case of annual plants, when the seed is ripened and the regenerative process completed, the root system ceases to grow and the nodules are slowly destroyed by the nodule-forming bacteria within and the saprophytic organisms without. In the case of perennial and biennial plants, when the root system for any reason is not actively functioning, the root tubercles are broken down in a manner similar to that mentioned above for annuals. It is claimed in general that improper drainage, drought, acidity of the soil, freezing, etc., interfere with the development of root tubercles, while proper aeration, regular and sufficient watering, the presence in the soil of insoluble carbonates, and suitable growing temperatures encourage their formation.

The daily march of transpiration in a desert perennial, EDITH B. SHREVE (*Carnegie Inst. Washington Pub. 194 (1914), pp. 64, pl. 1, figs. 27; abs in Ztschr. Bot., 7 (1915), No. 2, pp. 122, 123*).—This is a study of the behavior of *Parkinsonia microphylla*, which is said to have been selected on account of its ability to overcome the adverse conditions of a large evaporating surface during the entire year and a high death rate of its seedlings during the first two years. The methods and details of the investigation are given as regards transpirational behavior and factors correlated therewith.

It is stated that the actual transpirational behavior of the plant is indicated more accurately by measurements from small branches of trees growing in the open than by those from potted plants, on account of the previous environmental history of the latter. Transpirational behavior is described, this being considered as indicative of physiological regulation.

An interrelation between stomatal behavior and relative transpiration was apparent. A slight drying out of tissues is thought to account for some changes observed to occur in this connection.

Hourly changes in the relative transpiration rate, stomatal opening, water content of leaves and twigs, and leaf temperature indicate interrelations which are held to be governed by the ratio of demand to available supply of water.

The index of foliar transpiring power as an indicator of permanent wilting in plants, A. L. BAKKE (*Bot. Gaz., 60 (1915), No. 4, pp. 314–319, fig. 1*).—The author has extended his previous study (E. S. R., 34, p. 334) by making observations on the index of foliar transpiring power of sunflower when removed from the soil at 8.30 a. m. and allowed to wilt in the laboratory. The results show a steep decline for one hour, a very gentle decline during four hours, and a rather sharp rise for two hours, followed by a final decline.

The very steep initial decline is supposed to represent the prompt increase of incipient drying within the leaves as noted by Livingston and Brown (E. S. R., 27, p. 331). The gentle decline is ascribed to the period within which the continuous water columns of the plant remained intact, the leaves still slowly drawing water from the stem. The rise between the fifth and seventh hour is considered to represent the period of the breaking of the water columns, as the result of which the foliar transpiration increased on account of the removal of the tensile stress and the admission of air, following which no further tensile strength could be developed. After the seventh hour it is supposed that no more water entered the leaves from the stem and the leaves gradually dried out, showing meanwhile the decreased transpiring power which should accompany desiccation.

It appears then that the stage of wilting just previous to the rise referred to represents an approach to the most intense drying possible without rupture of

the water columns of the plant. At any rate, this rupture represents, apparently, a rather definite critical point in the course of water extraction by the plant, probably the same as that about which the concept of permanent wilting has developed. This plant appears to have reached the stage of permanent wilting in about five hours.

A new method of continuous automatic registration of transpiration, R. A. Robertson and S. J. Wilkie (*Trans. and Proc. Bot. Soc. Edinb., 26 (1914–15), pt. 4, p. 432, pl. 1*).—A comparatively simple apparatus is described by means of which the vapor transpired by a plant can be automatically trapped and weighed and a practically continuous record of the weight made on a revolving drum, the interruptions being so infrequent as not to detract materially from the value of the experiment.

The air is drawn through calcium chlorid tubes to the receiver containing the plant, and then out through a chlorid tube suspended from an arm of a delicately poised lever, to the other end of which is attached a tracing pencil recording on the revolving drum the depression of the other end. The chlorid is renewed once a day, the tubing is very flexible, and condensation on the glass cover of the receiver is obviated by the regulation of the rate of aspiration and by keeping the temperature constant.

Satisfactory continuous records extending over 12 to 30 days are said to have been made for herbaceous plants, succulents, and needle-leaved gymnosperms without appreciably damaging the experimental material.

Observations on the osazone method of locating sugars in plant tissues, S. Mangham (*Ann. Bot. [London], 29 (1915), No. 115, pp. 369–391, pl. 1*).—The author has extended the studies previously noted (E. S. R., 26, p. 229), and it is stated that additional light has been thrown on the value of the method employed (which is herein presented in greater detail) and on the limits of its application.

Among the results detailed, it is stated that on the whole the presence of osazone may be held to indicate with a fair degree of accuracy the distribution of the reacting sugars before treatment with the reagent. The presence of impurities in the form of various cell contents, particularly colloidal substances, is thought to influence the crystallization of osazone, and may account for some irregularity in its behavior in plant tissues. It is thought advisable, when using Senft's reagent, to reexamine the preparations from time to time over a period of at least four months before attempting to draw conclusions therefrom.

A bibliography is given.

Migration of reserve material to the seed in barley considered as a factor of productivity, E. S. Beaven (*Abs. in Rpt. Brit. Assoc. Adv. Sci., 84 (1914), pp. 660, 661*).—This is an abstract of a paper reporting and discussing the work of the author in collaboration with Biffin and Gosset. It gives a summary of the conclusions arrived at from the studies of the last five years, more particularly as to the value for selection purposes of the accurate determination of the relative seed-forming energy as shown by the coefficient of migration of different races of barley.

It is considered to be impracticable, during the initiatory stages of new races, to separate with any high degree of certainty the most productive races from among those originated by artificial crossing by employment of the merely empirical methods hitherto employed.

The distribution of nitrogen in the seeds of Acacia pycnantha, J. M. Petrie and H. G. Chapman (*Abs. in Rpt. Brit. Assoc. Adv. Sci., 84 (1914), pp. 666, 667*).—In this summary of work by the authors, it is stated that the whole

seeds of *A. pycnantha* which have been dried in air contain 4.5 per cent of nitrogen, while those with the testa removed show 5.5 per cent, this component being present partly as protein and partly as various other organic compounds. Percentages of nitrogen obtainable by different methods are given.

It is stated that with Sorensen's method of titration no fixation of formaldehyde by amino groups occurs. Attempts to isolate amino acids invariably resulted in the discovery of traces thereof. The amount of purin nitrogen present is said to be less than 1 per cent.

The action of radium and radio-activity on germination in the higher plants, H. Agulhon and Thérèse Robert (*Ann. Inst. Pasteur, 29 (1915), No. 6, pp. 261–273*).—The authors have made a study of the effects of radio-activity on seeds during the period in which the young plants are living on the reserves contained in the seed.

Peas were used in three series of experiments. In the first, they were exposed to such emanations as could traverse the walls of sealed tubes of thin glass containing radium bromid. In the second, the seeds were germinated in a solution containing radio-active material. In the third, the emanation was permitted to diffuse from the radium directly into the space containing the seeds.

In the first series, the observable action was unfavorable to development. In the second, the slight concentrations employed appeared to be ineffective. In the third, an accelerating effect on early growth was noted, associated with a degree of etiolation. The possibility that ozone production may have been a factor in the last mentioned case is discussed.

Rules and mechanism of inhibition and correlation in the regeneration of Bryophyllum calycinum, J. Loeb (*Bot. Gaz., 60 (1915), No. 4, pp. 249–276, figs. 41*).—The phenomena of inhibition of regeneration have been studied in *B. calycinum*, and it is stated that they follow the rule that if an organ inhibits regeneration or growth in another organ the latter often accelerates and favors regeneration in the former. This is interpreted to mean that the inhibiting organ receives something from the inhibited organ which is necessary for regeneration.

It is pointed out that this view is in harmony with the older assumption that the phenomena of inhibition in regeneration, and of correlation, may be attributed to the flow of material and to the block thereto after mutilation.

The determination of additive effects, W. J. V. Osterhout (*Bot Gaz., 60 (1915), No. 3, pp. 228–234, figs. 4*).—Having pointed out in previous papers (E. S. R., 31, p. 627; 32, p. 223) that in measuring antagonism it is of importance to determine the additive effects of the substances employed, the author gives analyses of typical cases. He concludes that in most cases two solutions which are equally toxic remain so (at least approximately) when both are diluted to the same degree, allowing the additive effect to be easily determined. In exceptional cases where this does not hold a value may be assigned to the additive effect. Similar considerations apply to unequally toxic solutions.

Acid accumulation and destruction in large succulents, E. R. Long (*Plant World, 18 (1915), No. 10, pp. 261–272, fig. 1*).—In these experiments, the investigations of Richards (E. S. R., 30, p. 429; 32, p. 429) have been extended to include the larger succulent cacti *Echinocactus wislizeni* and *Carnegiea gigantea*.

It was found that the acidity of the sap of these cacti was higher in the early morning than at sunset, probably on account of nocturnal metabolism and of daily high temperature and photolysis. The higher acidity present in the early morning in the outer portions is thought to be related to the concentration of sugar in this region. The comparative protection given to the inner portions, as regards heat and light, is attributed to the lesser diurnal differences

observable there. The movement of sap of low acidity from center to periphery has little effect upon the variations of acidity of these tracts, as compared with the conjoint effects of light and temperature in this respect, as seen in the outer portions.

Why certain plants are acrid, W. R. LAZENBY (*Sci. Mo., 1 (1915), No. 3, pp. 272–277*).—The author reports an examination of a number of species of plants noted for acridity, stating that the taste varies greatly among the plants tested. The acrid principle is not always volatile and was not found to be soluble in ether. Tests show that the acridity of several members of the Arum family is connected with the abundant presence of needle-shaped calcium oxalate crystals.

The absence of the acrid effect in case of some plants, the cells of which are crowded with raphides, is ascribed to the fact that in such cases the crystals are covered or embedded in an insoluble mucilage, which prevents their coming into contact with the tongue.

The study of plant enzyms, particularly with relation to oxidation, A. D. HALL, E. F. ARMSTRONG, ET AL. (*Abs. in Rpt. Brit. Assoc. Adv. Sci., 84 (1914), pp. 108, 109*).—This is a summary of the third report of the committee on this subject (E. S. R., 32, p. 523).

It is stated that in the flowers of certain white-flowered races of *Primula sinensis* which breed true to whiteness the peroxidase has a definite zonal distribution, and that such races, on crossing with colored forms, yield in the F_2 generation a certain number of plants the flowers of which show a similar zonal character. This pattern is referred to a lack of uniformity in distribution of the peroxidase constituent of the color-forming mechanism, not of the chromogen.

Partial success has been achieved in the discovery of agents indicative of the presence of reductases.

The conception that in life interaction takes place between substances in pairs, the one being oxidized and the other reduced, is considered to simplify materially the study of the oxidative changes in plants.

The formation of red pigments from yellow flowers by reduction and subsequent oxidation has been further studied, the experiments having been extended to quercetin, which has been reduced under a variety of conditions. As a rule colorless compounds are formed which become red on exposure to air or the addition of hydrogen peroxid.

A study has been made of the rates at which various carbohydrate solutions decolorize methylene blue in alkaline solution.

A study of the behavior of lipase in relation with water shows that the presence of even a small proportion of the latter greatly favors the action of the former in the reverse direction.

Studies in permeability.—I, The exosmosis of electrolytes as a criterion of antagonistic ion action, W. STILES and I. JÖRGENSEN (*Ann Bot. [London], 29 (1915), No. 115, pp. 349–367, figs. 14*).—The authors have investigated by the methods of physical chemistry the exosmosis of electrolytes from plant tissue, using disks of potato tuber and also living bean plants, as related to the composition of different external solutions.

From the results as given, they conclude that within certain limits the rate of exosmosis is a measure of toxicity. A decrease in this rate on addition of certain ions to solutions containing poisonous ions might be due, it is thought, to the so-called antagonism. It is claimed to have been shown that in some instances the phenomena are more complex than is generally assumed. The authors emphasize the necessity of examining and analyzing each case separately.

The results obtained by the methods of physical chemistry are held to indicate the possibility of securing in this way more definite information on the laws governing the exchange of substances between the interior and exterior of the cell. A bibliography is given.

A simplified apparatus for measuring the conductivity of electrolytes, R. P. HIBBARD and C. W. CHAPMAN (*Michigan Sta. Tech. Bul. 23 (1915), pp. 41, figs. 14*).—Attention is called to the value of the Wheatstone bridge for use in biological studies, especially those on the determination of the concentration of solutions and their conductivity. The authors have devised and described some modifications of the apparatus by which it is claimed that greater accuracy and simplicity of operation are secured. The method of operating the apparatus is fully described, and the results are given of some experiments which show the degree of precision obtained.

[Report of the research assistant in plant physiology], R. P. HIBBARD (*Michigan Sta. Rpt. 1915, p. 216*).—In connection with the work reported, a method of determining the mineral salt content of very dilute solutions was worked out (see above).

The agar shake for the detection of members of the coli-aerogenes group, W. GILTNER, C. W. BROWN, and J. C. HURLEY (*Michigan Sta. Rpt. 1915, p. 209*).—Some of the advantages and disadvantages of the agar shake in flask and tube detection of gas-producing bacteria are pointed out.

Some factors influencing the longevity of soil micro-organisms subjected to desiccation, with special reference to soil solution, W. GILTNER and H. VIRGINIA LANGWORTHY (*U. S. Dept. Agr., Jour. Agr. Research, 5 (1916), No. 20, pp. 927–942*).—A report is given of experiments conducted at the Michigan Experiment Station to determine the possibility of a protective effect of the soil solution on soil organisms subjected to desiccation. Suspensions of *Pseudomonas radicicola* in various media were used to determine the protective effect of the solution when dried on sand and the longevity of this organism when dried in quartz sand and in garden loam, and a study was made of the changes in the numbers and kinds of organisms when the solution was dried in different types of soils.

The authors found that the survival of nonspore-bearing bacteria in air-dry soil is due in part to the retention of moisture in hygroscopic form. Bacteria, so far as the species investigated are concerned, resist desiccation longer in a rich clay loam than in sand under the conditions of the experiment. If they are suspended in a solution extracted from a rich clay loam before being subjected to desiccation, they live longer than if subjected to desiccation after suspension in physiological salt solutions.

Attention is called to the fact that not one of the organisms isolated during the last two months of the experiment corresponded to any of the four organisms which predominated in the original soil solution used to inoculate the soils. The extinction of these species, it is thought, may be due to the unfavorable influence of association with other organisms during the period of active multiplication, or to their lack of endurance when supplied with less than the optimum amount of moisture.

The vitality of seeds buried in the soil, W. J. BEAL (*Michigan Sta. Rpt. 1915, pp. 218, 219*).—In continuation of an experiment previously noted (E. S. R., 6, p. 639), an account is given of the vitality of seeds buried in the soil for 36 years. Of 22 different species of weed seed, only *Brassica nigra*, *Capsella bursa-pastoris*, *Lepidum virginicum*, *Rumex crispus*, and *Verbascum thapsus* gave any germination.

Breeding experiments with Œnotheras, W. BATESON, F. KEEBLE, and R. P. GREGORY (*Abs. in Rpt. Brit. Assoc. Adv. Sci., 84 (1914), p. 247*).—This is a report

of the committee on the subject, which has received the report of Gates in continuation of his breeding studies previously noted (E. S. R., 32, p. 326). The results of these studies are said to have been confirmed and extended. It has been shown, in particular, that both blending and alternative inheritance of characters occur. Some of the plants are said to emphasize still further the fact that mutation and hybridization in Œnothera are separate processes, which may, however, go on at the same time.

FIELD CROPS.

Cereal experiments in Maryland and Virginia, T. R. Stanton (*U. S. Dept. Agr. Bul. 336* (*1916*), *pp. 51, figs. 6*).—This bulletin is for the most part a report on varietal tests in connection with experiments with winter and spring-grown cereals conducted by the Office of Cereal Investigations on the Arlington Farm since 1907, and in cooperation with the Maryland Experiment Station at College Park since 1904. The results are tabulated and discussed at some length and the leading varieties are grouped and described. The method of conducting the experiments at both places is outlined, the meteorological conditions for the different years are considered, and the results as a whole are summarized.

The varietal tests at College Park included 107 varieties and races of wheat, 5 of spelt, 3 of emmer, 13 of oats, and 12 of barley, while at the Arlington Farm the tests included 43 varieties and races of wheat, 12 of rye, 4 of spelt, 2 of emmer, 19 of oats, and 56 of barley. Only winter varieties of the various cereals were under test.

Of the winter wheats tested at Arlington Farm, 11 were selections from hybrids developed at College Park and Arlington Farm, and of these Virginia (C. I. No. 3277) proved most promising. The 5 leading varieties of wheat at College Park, with the 7-year average yield of each in bushels per acre, were as follows: China, 31.17 bu.; Mammoth Red, 31.09 bu.; Bearded Purple Straw, 30.95 bu.; Turkish Amber, 30.11 bu.; and Lancaster, 30.03 bu. At Arlington Farm the 5 leading varieties of winter wheat, with the 5-year average yield of each in bushels per acre, were as follows: Purple Straw (C. I. No. 1915), 32.09 bu.; Lancaster, 29.74 bu.; Dawson Golden Chaff, 29.37 bu.; Fultz, 29.17 bu.; and Purple Straw (C. I. No. 1957), 29.17 bu. Several varieties of winter wheat at Arlington Farm gave better yields on well-prepared land when sown at the rate of 3 or 4 pk. per acre than when larger quantities of seed were applied.

Among several varieties of winter spelt Alstroum ranked first with a 6-year average yield of 63.23 bu. at College Park and with a 5-year average yield of 74.08 bu. per acre at Arlington Farm. Black Winter emmer, the only variety tested, averaged 36.57 and 22.33 bu. respectively, for the same periods at College Park and Arlington Farm. The weight per bushel was figured at 30 lbs.

A varietal test of rye was conducted at Arlington Farm only. Of 12 varieties and selections tested Giant Winter, Virginia Winter, and Abruzzes were the leading sorts. The average yield of Giant Winter rye in a 4-years' test was 32.89 bu. Earlier seeding than commonly practiced by farmers gave very satisfactory results with rye.

The leading varieties of winter oats at College Park were Winter Turf, Bicknell, and Culberson, while the most promising at Arlington Farm were the Red Rustproof, Winter Turf, Bicknell, and Culberson, in the order named. Winter Turf proved the hardiest and most dependable variety, but it is pointed out that its late maturity and tendency to lodge are objectionable and that the Culberson and Bicknell, which mature from ten days to two weeks earlier, are to be preferred to it in eastern and southern Maryland and eastern Virginia.

The leading varieties of winter barley at College Park were Maryland Winter, Mammoth Winter, and Tennessee Winter, varieties practically identical, and at Arlington Farm, Tennessee Winter, Wisconsin Winter, Maryland Winter, and Texas Winter. None of the 18 two-rowed spring barleys grown from fall seeding at Arlington Farm proved satisfactory. A hybrid two-rowed winter barley has been developed which produced an average yield of 25.3 bu. in 1913 and 1914. Varieties of naked barleys also failed to give satisfactory results.

Winter wheat, spelt, rye, barley, and oats gave very satisfactory results, and the varieties most strongly recommended for eastern and southern Maryland and eastern Virginia are as follows: China, Fulcaster, Dietz, Fultz, Purple Straw, Bearded Winter Fife, and Bearded Purple Straw winter wheat; Alstroum winter spelt; Giant Winter, Virginia Winter, and Abruzzes winter rye; Winter Turf, Culberson, Bicknell, and Red Rustproof winter oats; and Tennessee Winter and Wisconsin Winter barley.

Department of farm crops, N. S. Robb (*Idaho Sta. Bul. 84* (*1915*), *pp. 20, 21*).—The best yield of Canada field peas in a seeding test was obtained from seeding at the rate of from 85 to 100 lbs. per acre. The largest yield secured in a test of 9 varieties was 44 bu. per acre.

In 1915 Red Russian stood first in yield with 50.8 bu. per acre among 4 varieties of winter wheat, Early Bart with 35.7 bu. among 3 varieties of spring wheat, and White Smyrna with 84 bu. among 3 varieties of spring barley, including White Winter sown in the spring. In a 5-year test of 3 varieties of winter wheat Red Russian gave an average yield of 43.6, Turkey Red 39.5, and Forty Fold 37.5 bu. per acre. Palouse Bluestem, a spring wheat, grown for 5 years gave an average yield of 37.7 bu. per acre, and in a 3-year test of 3 varieties of spring barley White Winter sown in the spring yielded on the average 72.5, California Feed 62.4, and White Smyrna 61.6 bu. per acre. The average yield for 3 years of White Winter barley sown in the fall was 67.6 bu.

Aberdeen substation, L. C. Aicher (*Idaho Sta. Bul. 84* (*1915*), *pp. 31–35*).—A general description is given of the work in progress, grouped into dry farm and irrigation projects. The dry farm work included rotation experiments, culture tests, and variety and crop trials, and the irrigation work consisted largely of experiments in crop production.

The results of the dry farm projects indicated the value of alternate fallowing and cropping, and that one-way drilling of 3 to 3½ pk. of seed per acre to a depth of 2½ to 3 in. from August 15 to September 15, when moisture conditions are right, on thoroughly tilled, summer fallow plowed 7 in. deep, the crop being given no spring harrowing and the grain being allowed to harden slightly before harvesting, is the most promising practice in growing winter wheat at the substation. Other results are reported as warranting the recommendation of Turkey Red winter wheat for the dry farms in that section of the State.

The best early varieties of potatoes were found to be Early Rose, Early Ohio, and Bliss Triumph, while Pearl was the leading late variety. Promising results are reported with alfalfa, sweet clover, and field peas under dry farm conditions.

The crop work under irrigation indicated that Defiance, Dicklow, and White Bluestem wheats are desirable for spring planting and that Swedish Select and White Bonzana oats, Beldi and Sandrel feed barleys, and Hanna and Chevalier brewing barleys are promising varieties. Results with 22 sorts of field peas were regarded as warranting the recommendation of Amraoti, Wellwood, Lima, and Kaiser for further distribution. It was found that sowing

from 10 to 12 lbs. of alfalfa seed per acre was ample to insure a good stand and a good quality of hay. Under irrigation the better yielding varieties of early potatoes were Early Rose, Early Ohio, and Irish Cobbler; and the later varieties, Idaho Rural, Netted Gem, and Pearl.

Report of the division of farm crops, V. M. SHOESMITH (*Michigan Sta. Rpt. 1915, pp. 226–228*).—A general review by F. A. Spragg is given of the crop improvement work of the division. Considerable attention was given to the elimination of error in plat experiments with crops and a method worked out for the purpose and involving the use of a factor called the coefficient of yield is described.

Agronomy (*New Mexico Sta. Rpt. 1915, pp. 35–42*).—In a culture test with corn, dropping the seed behind the plow when plowing stubble ground in the spring was compared with plowing and harrowing the ground and planting with a corn planter. In connection with the first method irrigation was applied before and with the second after planting. The yields are reported as in favor of the use of the corn planter by 2.7 bu., and of irrigation before planting by 3.9 bu. per acre. Ten tons of barnyard manure per acre gave an increase in yield of 2 bu. The different varieties grown in the test yielded as follows: Reid Yellow Dent 37.7 bu., Hickory King 40.1 bu., and Mexican June 43.3 bu. per acre. A yield of Mexican June at the rate of 110.3 bu. per acre is also recorded. The percentage of stalks and ears attacked by smut is given for the different varieties.

In culture tests with wheat, seeding at the rate of 60 lbs. per acre gave better results than the use of 90 or 120 lbs. of seed per acre, and wheat seeded November 1 and December 1 gave much better yields than that seeded on October 1, January 1, February 1, or March 1.

An experiment in the eradication of Johnson grass through clean cultivation gave promising results, but reseeding took place through seed carried down from higher levels in the irrigation water.

Sudan grass grown under irrigation yielded per acre 1,894 lbs. from the first, 3,057 lbs. from the second, and 1,864 lbs. from the third cutting of the season.

First annual report of Vivian experiment and demonstration farm, A. N. HUME, M. CHAMPLIN, and J. G. HUTTON (*South Dakota Sta. Bul. 162, pp. 266–279, fig. 1*).—The history and climatic and soil conditions of the farm are briefly noted, and the lines of work inaugurated together with the plans of conducting the farm are outlined. Some of the year's results with different methods of soil preparation are given in tables but no definite conclusions are drawn. It is stated that the results given will be more completely analyzed in the light of further data and be used later in bulletins dealing with specific subjects.

[Farm crops] (*Washington Sta. Bul. 127 (1915), pp. 13–15, 29, 30, fig. 1*).—Forage crop studies are briefly described and some of the results reported. In a test of growing alfalfa in rows the yields were 7,443, 7,271, and 6,270 lbs. per acre from two cuttings from plantings in rows 7, 14, and 28 in. apart, respectively. A variety of alfalfa developing root stocks was found in the forage crop nursery. A mixture of Kentucky blue grass, timothy, orchard grass, brome grass, redtop, alfalfa, red clover, alsike clover, and white clover sown in 1912 gave abundant pasturage each year. In 1915 orchard grass predominated, and timothy, Kentucky blue grass, and brome grass had diminished, while there remained only a trace of redtop. Alfalfa persisted better than the other legumes.

A study of the influence of cultivation on the nitrogen content of wheat showed increases in the nursery selections at the station amounting to approximately 33 per cent more nitrogen than was found in the samples taken

from the check plats. Selections made at Grandview showed approximately as much nitrogen in wheat grown with 20 in. of irrigation water as in wheat grown with smaller quantities. Results in 1914 indicated that winter wheat can be grown with a nitrogen content as high as that found in spring grown crops. The percentage of nitrogen in wheat grown at Ritzville was higher than in wheat grown at Pullman, which is ascribed to the more irregular growth and the poorer stand of some of the varieties grown at Ritzville as compared with the Pullman crop.

Farm crop report, E. B. Stookey (*Washington Sta., West. Wash. Sta., Mo. Bul., 3 (1916), No. 11, pp. 5–9*).—Brief popular notes are given on variety and crop tests with cereals, clovers, and other legumes, grasses, and miscellaneous forage crops.

Cover crops for Porto Rico, C. F. Kinman (*Porto Rico Sta. Bul. 19, pp. 32, pls. 8*).—This bulletin discusses the selection of cover crops to meet the conditions of the climate and the requirements of the crops of Porto Rico more especially citrus fruits, coconuts, and pineapples; describes in general the results obtained with different plants grown as cover crops; and enumerates the plants which the station recommends for the purpose, together with a number of wild leguminous plants considered of value in this connection. Descriptive and cultural notes are given of the cowpea (*Vigna sinensis*), jack bean (*Canavali ensiformis*), sword bean (*C. gladiata*), Lyon bean (*Stizolobium niveum*), Bengal or Mauritius bean (*S. aterrimum*), *S. cinereum*, *S. velutinum*, Florida velvet bean (*S. deeringianum*), and the pigeon pea or gandul (*Cajanus indicus*) as cover crops for Porto Rico; and of mani cimarrona (*Chamæcrista diphylla*), matraca (*Crotalaria retusa*), zarzabacoa galana (*Desmodium adscendens*), zarzabacoa común (*D. incanum*), habichuela cimarrona (*Phaseolus adenanthus*), yerba rosario (*Æschynomene americana*), conchita peluda (*Centrosema pubescens*), tamarindillo (*Cassia chamæcrista*), habichuela parada (*P. semierectus*), and mato de la playa (*Canavali obtusifolia*) as wild leguminous plants valuable for orchards or other cultivated lands, and worthy of protection and in some instances of cultivation.

Thinning experiments with potatoes, O. B. Whipple (*Montana Sta. Bul. 106, pp. 3–8, fig. 1*).—A preliminary report is presented on thinning experiments with potatoes grown with and without irrigation. The plants were thinned the first two weeks of July to the strongest plant in the hill. The greatest apparent benefit derived from thinning was the decrease in the amount of culls. Although the total yield and the yield of marketable tubers was greatest from the unthinned rows, the quality of the tubers with reference to size and uniformity was better from the thinned crop.

Seed inspection (*Maine Sta. Off. Insp. 73 (1915), pp. 197–224*).—Tables are given showing the results of the examination of samples of seeds collected in the spring of 1915, together with a list of the weed seeds found.

Weeds, J. C. Arthur (*Indiana Sta. Rpt. 1915, pp. 31, 32*).—Brief notes on cooperative and demonstration work in the control of wild garlic and Canada thistle by means of spraying with orchard heating oil, red sorrel by sulphate of iron, and of other weeds by the use of a proprietary weed destroyer, are given. A study of weed seeds in the soil was made by taking several samples of soil from different fields and placing them in the greenhouse. In one sample which contained a cubic foot of soil 363 plants came up, and in another 342 plants. In soil from a carefully cultivated field a much smaller number of seeds was found than in one from poorly cultivated ground. Most of the weed seeds were found in the upper 6 in. of the soil.

HORTICULTURE.

Hotbed construction, C. B. Sprague (*Washington Sta. Popular Bul. 98 (1916), pp. 3–15, figs. 5*).—Practical directions are given for the construction and management of hotbeds and cold frames, together with some data on temperature tests of hotbeds under different methods of handling the manure and covering the frame.

The greatest variations in soil temperatures were in beds where no water was applied to the manure when the bed was being made. Beds which had an excess of cold water added to the manure in the making gave the most even temperature but were several days longer in acquiring their maximum temperature. Manure made extremely wet and soggy by the application of cold water does not heat properly. Placing the manure in the pit before it has time to warm through thoroughly causes the temperature to rise slowly and unevenly over the bed. Although excessive packing by tramping and tamping with heavy tampers retards the heating at the start, the tests suggest that the life of the manure bed will be lengthened by this practice. The air readings in the beds covered with single glass sash were higher in the daytime and lower at night than those under double glass sashes.

The commercial grading, packing, and shipping of cantaloups, C. T. More and G. V. Branch (*U. S. Dept. Agr., Farmers' Bul. 707 (1916), pp. 23, figs. 18*).—This publication is designed to aid growers and shippers in preparing their cantaloups for market in such a way that they may realize higher average returns with fewer losses. The subject matter is based on the results of careful observations of grading, packing, and shipping operations as now conducted by the most progressive growers and shippers in some of the best commercial cantaloup sections of the country, together with investigations of cantaloup-marketing conditions in many of the larger cities.

The tomato, R. Rovetta (*Il Pomodoro. Milan: Ulrico Hoepli, 1914, pp. XV+279, pl. 1, figs. 89*).—A manual of information relative to tomato culture and the preparation of various tomato products such as canned tomatoes, tomato sauce, and paste. Information is also given relative to the utilization of the refuse as stock feed and fertilizer, including the manufacture of tomato-seed oil and its adaptation for various purposes. The various types of machinery and equipment used in the preparation of tomato products are described.

Texas orchard and nursery inspection laws and digest of the laws and regulations of the different States, covering interstate shipment of nursery stock, E. L. Ayers (*Texas Dept. Agr. Bul., n. ser., No. 19 [1916], pp. 29*).—The laws and regulations here noted deal both with insect pests and plant diseases.

Influence of low temperature on fruit growing in New York State, W. H. Chandler (*Cornell Countryman, 13 (1916), No. 5, pp. 373–377, figs. 4*).—A popular discussion of various types of injury to fruit trees caused by low temperature.

[Report of horticultural investigations] (*New Mexico Sta. Rpt. 1915, pp. 55–65, figs. 2*).—Data are given showing the dates of blooming and picking and yields and returns from the different varieties in the experimental peach orchard. Experiments dealing with the winter treatment of Vinifera grapes were continued. The data obtained show the advantage of winter protection. Covering the vines with moist soil during the winter appears to be an actual benefit to them. A table is given showing the average yield per vine, the actual yield per plat, and the estimated yield per acre for the different varieties under different methods of winter treatment. A test of the newer varieties of plums and sweet and sour cherries was started during the year. A plan is given of the test orchard, together with a list of the varieties planted.

The results of spraying Bartlett pears for the codling moth indicate that it can be successfully controlled with four sprayings. The observations of the station continue to show that a larger percentage of the fruit is stung in places other than the calyx end. A preliminary test as to the keeping quality of Bartlett pears is also noted.

[Report of the] department of horticulture, C. C. VINCENT (*Idaho Sta. Bul. 84 (1915), pp. 21–26*).—In this brief progress report on horticultural investigations for the year, lists of apple crosses made for the 6-year period, 1910 to 1915, are included.

A pruning experiment which has been conducted to determine the relative merits of summer *v.* winter pruning of apple trees has shown for a 4-year period an increased yield in favor of summer pruning. The increase ranged from 1.6 per cent in the case of Rome Beauty trees to 111 per cent in the case of Wagener trees. Higher colored fruit was also secured in the summer pruned plats.

Dusting and spraying experiments with apples, D. REDDICK and C. R. CROSBY (*New York Cornell Sta. Bul. 369 (1916), pp. 309–356, pls. 4, figs. 9*).—The experiments herein reported were undertaken during the 1915 season for the purpose of confirming the results of previous experiments by the authors and by Blodgett (E. S. R., 32, p. 836). Spraying experiments were conducted in five orchards in different sections of western New York. Comparisons were made of the various dusted plats with plats of trees treated with the standard spray materials, lime-sulphur solution and lead arsenate, and with a plat of trees that received no summer treatment. Details as to quantities of materials used, dates of application and conditions influencing the same, time required, comparative costs, and results are given in connection with the individual experiments.

The previous work indicated that satisfactory insect control could be secured with a dust mixture containing 90 per cent sulphur and 10 per cent of arsenate of lead. This result was confirmed in the present experiments. As a general formula for use in western New York under average western New York conditions, however, the authors recommend a mixture containing 85 per cent of exceedingly finely ground sulphur and 15 per cent of powdered arsenate of lead applied in amounts of from 1.25 to 2.5 lbs. per tree in each application. The experiments indicate that 15 oz. of finely ground sulphur applied per tree in each application will give effective control of the scab disease and of sooty blotch. So far as can be determined the sulphur can be applied directly in this amount. The results in one experiment, however, indicate that the use of a filler allows for better distribution. Terra alba, or finely ground gypsum, used in equal parts with sulphur is a satisfactory filler.

In some of the experiments a number of substances were added to the dust mixtures to determine whether their destructive properties could be increased thereby. These substances included hydrated lime, finely ground gypsum or terra alba, finely powdered soap, and casein and lime. The dust mixtures were apparently not improved by any of the diluents used.

As in the previous work the experiments show that powdered sulphur applied dry does not adhere as well as sulphur applied in liquid form as in lime-sulphur solution, or as the very fine sulphur precipitated from the solution on the addition of arsenate of lead or an acid substance. In every case but one in which scab was a factor the percentage of scab on the dusted plats was greater than on the sprayed plats, although in some cases the difference was slight.

Summing up the station's dusting experiments as a whole the authors conclude that a mixture of an insecticide and a fungicide can be applied in

powdered form, using air as a carrier, with better commercial results in the control of preventable apple diseases and of apple insects than can be obtained by spraying. Some general suggestions based on the experimental work are given relative to spraying materials, method, thoroughness, and time of application, home mixing of materials, applicability of the dust method, and equipment.

Blight-resistant roots.—The first step toward pear blight control, A. L. Wisker (*Mo. Bul. Com. Hort. Cal., 5 (1916), No. 2, pp. 48–53, fig. 1*).—An address before the State Fruit Growers' Convention, at Palo Alto, Cal., in July, 1915, in which the author deals particularly with our present knowledge of blight-resistant roots.

The taxonomic value and structure of the peach leaf glands, C. T. Gregory (*New York Cornell Sta. Bul. 365 (1915), pp. 183–222, figs. 98*).—The investigation here reported was undertaken primarily to determine whether peach leaf glands are sufficiently stable and uniform in their characters to be used as a basis for separating the varieties into sections. The leaves used in the work were obtained from the peach district along Lake Ontario, from the Missouri Fruit Station, and from the New York State Station at Geneva.

The glands of all the leaves were carefully examined and are here discussed with reference to their morphology, physiology and histology, comparison with the spines of the leaf, secretory process, decomposition, and variability. A number of drawings of certain glands are also included. The available literature on the subject was consulted and is here listed.

Among the varieties studied four kinds of leaves were found, those with reniform glands, those with globose glands, glandless leaves, and leaves having mixed or indistinctive glands. The great majority of varieties were found to have very definitely shaped glands, whereas other varieties were found that were not adapted to any fixed classification because of the variability of the glands. In view of this variability in conditions it is considered inadvisable to attempt a definite classification into sections, but a list of varieties is given with their gland characteristics, the commercial varieties of New York State being especially considered and illustrated.

The structure of the glands shows that they are true glands having an upper layer of long, rectangular, secretory cells that produce a sweet substance, the function of which is not apparent. After the glands have ceased secreting they begin to decay and slowly disappear until almost nothing is left. The decaying process is preceded in every case by a suberization and thickening of the cell walls. A study of the transitional forms indicates that the glands are merely modified leaf spines. The leaves with reniform glands are apparently the highest type and the glandless leaves the lowest type. Whenever typical glandless leaves become possessed of glands they are always of the globose type. The margins of normally glandless leaves are deeply and doubly serrate while the margins of leaves with glands are always single and crenate. The development of glands on a normally glandless leaf is accompanied by the transformation of the serrations to crenations.

Cost of a peach orchard, C. J. Hayden (*Country Gent., 81 (1916), No. 7, p. 329*).—Data are given on the cost of establishing and maintaining a peach orchard of 10,000 trees during the first three years.

Report on experiment in picking, packing, handling, cool storage, and transportation of peaches, E. Meeking (*Jour. Dept. Agr. Victoria, 14 (1916), No. 1, pp. 41–55, figs. 3*).—Tabular results are given on some cooperative peach

picking, packing, handling, cool storage, and transportation experiments conducted under the direction of the Victoria Department of Agriculture.

Size grades for ripe olives, F. T. Bioletti (*California Sta. Bul. 263 (1916), pp. 215–227, figs. 2*).—In this bulletin the author discusses the uses and methods of sizing olives, presents data showing a great variation in the present practice of sizing, and describes some work conducted with a view to establishing a basis for a common standard.

An attempt was made to discover the relation between diameter and number of olives per pound. This relation, however, was found to vary according to the shape of the olive and its specific gravity. From a large number of weighings and measurements a factor has been determined for each of several of the principal pickling olives from which the number of olives to the pound for the various sizes may be determined. This factor differs for each variety of different shape, and varies especially with the change in ratio between length and thickness of the olive. Various systems of size grading with reference to diameter are compared and a grade based on a difference in diameter of 88 per cent is proposed. In this system of grading each grade is almost exactly 88 per cent of the average diameter of the next larger grade and weighs 68 per cent as much per pound. The number of olives to the pound would be inversely proportionate to the weight and the number for each grade would be 68 per cent of the next smaller grade.

Results of reconstitution in Sicily, F. Paulsen (*Bul. Agr. Algérie, Tunisie, Maroc, 21 (1915), No. 8, pp. 189–206*).—A review of progress made during the past 25 years in the reconstitution of phylloxera-infested vineyards by the use of American vines as stocks, with special reference to work conducted at the Royal Nursery of American Vines of Palermo.

Mulching the citrus orchard, D. C. Fessenden (*Cal. Citrogr., 1 (1916), No. 4, p. 25*).—A brief résumé of mulching experiments in citrus orchards in southern California that are being conducted by a number of private interests, as well as by the state experiment station and the U. S. Department of Agriculture.

Bud sports in agriculture, C. S. Pomeroy (*Cal. Citrogr., 1 (1916), No. 4, pp. 16, 17, fig. 1*).—The author briefly cites instances of bud sports in fruit trees and other plants, special reference being made to some results secured by the Bureau of Plant Industry of the U. S. Department of Agriculture in bud selection work with citrus fruits in California (E. S. R., 34, p. 639).

Notes on the budding of cacao on an estate scale in Trinidad, W. G. Freeman (*Proc. Agr. Soc. Trinidad and Tobago, 16 (1916), No. 1, pp. 22–28*).—The author gives a brief general statement of progress made in budding cacao, together with an outline of experiments in budding and grafting cacao that are being conducted on an estate in Trinidad.

Diseases and pests of the coconut in Netherlands India, P. E. Keuchenius (*Teysmannia, 26 (1915), No. 10, pp. 601–614*).—Descriptive notes are given on a number of insect pests and diseases of the coconut, including a short bibliography of related literature.

Pecan culture, with special reference to propagation and varieties, C. A. Reed (*U. S. Dept. Agr., Farmers' Bul. 700 (1916), pp. 32, figs. 17*).—A practical treatise on pecan culture, in which consideration is given to the economic importance of the pecan, native range, cultural distribution, soil and moisture requirements, propagation, seed selection, care of the seed, planting the seed, comparison of budded and grafted trees, cleft grafting, formulas for grafting wax, preparation of grafting cloth, care of cleft grafts, nursery whip grafting, care of whip grafts, annular budding, patch budding, care of annular and patch buds, chip budding, length of time trees should remain in the nursery, the pres-

ervation of nut-bearing forests, top-working, trees suitable for top-working, how to top-work, top-working the hickory with the pecan, planting, cultivation, bearing age, present prices of the nuts, marketing pecans, the selection of varieties, "papershell" pecans, and varieties.

Included in the discussion of varieties are lists of varieties which have proved most promising in different sections of the pecan region, together with descriptions of the more important varieties taken largely from Bulletin 251 of the Bureau of Plant Industry, previously noted (E. S. R., 27, p. 645).

Intensive cultivation of ornamental plants, M. GAJON (*Estac. Agr. Cent. [Mexico] Bol. 9–12 (1914), pp. 102, figs. 41*).—A popular treatise with special reference to Mexican conditions. Descriptive notes are given on flowering and other ornamental plants suitable for culture in pots or in gardens.

Climbing plants, W. WATSON (*London and Edinburgh: T. C. & E. C. Jack [1916], pp. X+132, pls. 24*).—A popular treatise on climbing ornamental plants, discussing the various classes of climbers, their adaptation, and specific cultural requirements.

The daffodil yearbook, 1915 (*London: Roy. Hort. Soc., 1915, pp. VII+135, pls. 33*).—A compendium of articles by various authorities, dealing with different phases of daffodil culture, new varieties, breeding work, adaptation of daffodils for various situations and purposes, dates of flowering of different varieties, reports of shows, and other information. A bibliography on daffodils is appended.

The amateur orchid cultivators' guide book, H. A. BURBERRY (*Liverpool: Blake & Mackenzie, Ltd., 1915, 4. ed., pp. VIII+182, pls. 9, figs. 24*).—A textbook and guide to the study of orchids and their culture.

In addition to cultural directions for orchids in general, information is given relative to specific requirements of various classes of orchids, together with lists of varieties that may be grown in cool, intermediate, and warm greenhouses. The present edition of the work embodies the results of recent experiences in orchid culture, and includes a new chapter on the culture of *Odontoglossum crispum*. Instructions for the treatment of orchids throughout the year are presented in tabular form and a number of questions and answers relating to orchids are included.

The home grounds, E. G. DAVIS and R. W. CURTIS (*New York Cornell Sta. Bul. 361 (1915), pp. 293–435, figs. 61*).—In part 1 of this bulletin the first-named author discusses some elemental principles and furnishes concrete directions dealing with the arrangement of the home grounds. Consideration is given to the house, roads, and walks, and other surroundings; grading and planting; improving the outlook; nature and character of plantings; selection of trees; the use of shrubs; and flower gardens. In part 2 the last-named author has prepared lists of plant materials to be used in selecting the proper trees, shrubs, and smaller growths suitable for home grounds. The lists are prepared with due reference to various types of planting; different soil, light, and moisture conditions; and for securing different effects with reference to color of foliage, fruit, flower, etc.

A historical sketch of the Royal Botanic Gardens, Peradeniya, H. F. MACMILLAN (*Trop. Agr. [Ceylon], 46 (1916), No. 1, pp. 4–9, pls. 4*).—A brief résumé of the development of the Royal Botanic Gardens since their location in Peradeniya in 1821.

FORESTRY.

Woodlot conditions in Broome County, New York, F. B. MOODY and J. BENTLEY, JR. (*New York Cornell Sta. Bul. 366 (1915), pp. 227–244, figs. 6*).—This bulletin embraces the results of a survey of woodlot conditions conducted

in Broome County in 1914. It describes the present condition of the woodlot, including topography and soil, distribution of forest and woodland, forest types, and past treatment of woodland. Suggestions are then given relative to methods of treatment whereby these conditions can be improved and the woodlots made to yield a regular income to their owners. In this connection information is given relative to species suitable for planting in Broome County and assistance rendered to landowners by the State in securing planting stock and in granting relief from taxation on woodland. A list is also give of the important commercial species and the economic uses of their wood.

Two demonstration areas have been located in the county with the view of furnishing examples of applied forestry.

Woodlot conditions in Dutchess County, New York, F. B. Moody and J. Bentley, Jr. (*New York Cornell Sta. Bul. 368 (1915), pp. 283–302, figs. 8*).—A report similar to the above on woodlot conditions in Dutchess County, N. Y.

Cooperative shelter-belt planting on the northern Great Plains (*U. S. Dept. Agr., Bur. Plant Indus., Office Dry-Land Agr. Doc. 1 (1916), pp. 6*).—This pamphlet outlines the cooperative shelter-belt planting in the northern Great Plains as conducted under the direction of the Office of Dry Land Agriculture and describes the conditions under which a cooperative shelter-belt planting is made. The territory covered by the work is that part of North Dakota and South Dakota lying west of the one hundredth meridian and of Montana and Wyoming which lies east of the 5,000-foot elevation.

Cooperative shelter-belt development in the northern Great Plains (*U. S. Dept. Agr., Bur. Plant Indus., Office Dry-Land Agr. Doc. 2 (1916), pp. 3, fig. 1*).—This pamphlet contains instructions for the planting and care of trees and has been prepared with special reference to its use by shelter-belt cooperators. See above abstract.

The spruce and balsam fir trees of the Rocky Mountain region, G. B. Sudworth (*U. S. Dept. Agr. Bul. 327 (1916), pp. 43, pls. 35*).—This bulletin deals with the distinguishing characters, geographic distribution, and forest habits of all of the spruce and balsam fir trees that grow naturally within the Rocky Mountain region, including also Canadian territory lying directly north of the Rockies and Mexican territory adjacent to the Southwest. Keys are provided for the identification of the genera and species.

The bamboos in the cordilleras of the South, C. K. Hosseus (*Bol. Min. Agr. [Buenos Aires], 19 (1915), No. 3–4, pp. 195–208, figs. 8*).—An account of the bamboos in the Andes region of South America with reference to their characteristics, distribution, forestal importance, importance to the industries, influence on agriculture, and use for protection against wind.

Observations on some reputed natural eucalyptus hybrids, together with descriptions of two new species, J. H. Maiden and R. H. Cambage (*Jour. and Proc. Roy. Soc. N. S. Wales, 48 (1914), pt. 3, pp. 415–422*).—In this paper three reputed natural eucalyptus hybrids are discussed, and two of them are named and described as *Eucalyptus kybeanensis* n. sp. and *E. benthami* n. sp.

Notes on Eucalyptus (with a description of a new species) No. 3, J. H. Maiden (*Jour. and Proc. Roy. Soc. N. S. Wales, 48 (1914), pt. 3, pp. 423–432*).—A new species, *Eucalyptus præcox*, is described and notes are given on six previously published species.

Notes on some forest species of Madagascar, E. Perrot and A. Gérard (*Bul. Écon. Gouvt. Gén. Madagascar, 15 (1915), I, No. 1, pp. 73–79, figs. 4*).—The principal wood characteristics of a number of Madagascar forest trees are briefly noted.

A review of the net revenues from the Saxony state forests for the year 1915, WAPLER (*Tharand. Forstl. Jahrb., 66 (1915), No. 6, pp. 420–431*).—A statistical review relative to the yield in major and minor forest products, revenues, expenditures, etc., for the various districts of Saxony for the year 1913.

Annual progress report upon state forest administration in South Australia for the year 1914–15, W. GILL (*Ann. Rpt. State Forest Admin. So. Aust., 1914–15, pp. 13, pls. 7*).—This is the usual report relative to the administration and management of the state forests in South Australia, including a financial statement for the year ended June 30, 1915. Data relative to forest areas, planting and other forest operations, revenues, expenditures, etc., are presented in tabular form.

[Report of the forestry division], J. M. PURVES (*Nyasaland Dept. Agr., Ann. Rpt., 1915, pp. 25–28*).—A brief progress report on operations in the forest nurseries and plantations in Nyasaland, together with a financial statement for the year.

Progress report of the Forest Research Institute for the year 1914–15, L. MERCER (*Rpt. Forest Research Inst. [Dehra Dun], 1914–15, pp. 22*).—A progress report of investigations in silviculture, forest botany, forest economy, forest zoology, and forest chemistry. Lists of recent publications and of all publications issued since the institute was established are appended, together with a financial statement for the year.

Forestry in Netherlands India, C. S. LUGT (*Het Boschbedrijf in Nederlandsch Indië. Haarlem: H. D. Tjeenk Willink & Son, 1912, pp. 125, pl. 1, figs. 35*).—This is the second of a series of handbooks dealing with the agricultural products of the Dutch East Indies.

The present work takes up the history, development, administration, and exploitation of teak and wild timber forests on Java and other islands of Netherlands India. Information is also given relative to cultural operations, transportation, yields, and revenues from forest operations.

Suggested alterations in the law relating to estate forestry, B. W. ADKIN (*Quart. Jour. Forestry, 10 (1916), No. 1, pp. 1–9*).—In this paper the author recommends certain changes in laws pertaining to timber estates in England.

Practical forest assessment and survey, E. H. F. SWAIN (*Dept. Forestry, N. S. Wales, Bul. 9 (1914), pp. 16, figs. 3*).—The system of forest strip survey here outlined is an Australian adaptation of the methods adopted by European and American forest services and timber firms.

Collection of statistics, W. SCHLICH and L. S. WOOD (*Quart. Jour. Forestry, 10 (1916), No. 1, pp. 42–51*).—In this article the authors give suggestions for the collection of forest data in Great Britain to be used in the preparation of volume tables and preliminary tables of the volume and value increment of trees and woods. Sample measurements of 36 beech trees are given in order to explain the method recommended.

Preservative treatment of fence posts, G. B. MACDONALD (*Iowa Sta. Bul. 158, abridged ed. (1915), pp. 3–31, figs. 8*).—An abridged edition of the bulletin previously noted (E. S. R., 34, p. 153).

DISEASES OF PLANTS.

Some observations on the study of plant pathology, G. MASSEE (*Jour. Econ. Biol., 10 (1915), Nos. 1–2, pp. 29–48*).—This is a somewhat general presentation of results of the author's observations on diseases of plants, resistant varieties, distribution of disease, legislation in this connection, the training of plant pathologists, and the mycoplasm theory.

The author is of the opinion that an academic knowledge of mycology alone is of comparatively little value from the standpoint of arresting plant diseases, owing to the large number of factors which may be operative.

The claim recently made, on the basis of a study of silver leaf disease, that this disease may apparently be due at times to the fungus *Stereum purpureum* and at others to undetermined physiological causes, is regarded as justifying alarm if it proves to be indicative of a possibility more or less general.

Plant diseases, J. C. Arthur (*Indiana Sta. Rpt. 1915, pp. 29–31*).—The author briefly reviews the investigations in plant diseases conducted during the year covered by the report. These include studies on grass and sedge rusts, control of oat smut and potato scab, soil sanitation, and the results of a plant disease survey of the State.

In connection with the work on control of oat smut, various forms of machines for treating the grain have been tested, some of them with considerable success. Further experiments with hydrogen peroxid for the prevention of stinking smut of wheat and smut of oats indicate that this chemical can not be used effectively as a grain disinfectant.

In the notes from the plant disease survey, a dozen or more diseases are reported for the first time as occurring in this State.

[Report of the research assistant in plant pathology], G. H. Coons (*Michigan Sta. Rpt. 1915, pp. 213–215*).—One of the principal studies of the year reported was that a serious canker of apple due to *Plenodomus* sp., a portion of which has already been reported upon (E. S. R., 34, p. 647).

Among reports of other investigations, an account is given of experiments on potato seed treatment, the results confirming those previously noted (E. S. R., 31, p. 543). A disease of celery characterized by stunted growth is briefly described. This trouble is said to be serious in a number of centers of celery production, in some cases causing almost total loss. As a result of this study, the author considers the disease of bacterial causation. Attempts were made to determine control measures, and among the most promising was soil sterilization.

Diseases and enemies of cultivated plants in the Dutch East Indies, A. A. L. Rutgers (*Dept. Landb., Nijv. en Handel* [*Dutch East Indies*], *Meded. Lab. Plantenziekten, No. 9* (*1914*), *pp. 24*).—Notes are given on diseases of plants as observed, including *Phytophthora faberi*, *Corticium salmonicolor*, *C. javanicum*, *Fomes semitostus*, *Hymenochæte noxia*, *Thyridaria tarda*, and *Phyllosticta* sp. on rubber trees; a leaf curl and a bacterial disease of peanuts; Piricularia and Helminthosporium on rice; Phytophthora on tobacco; Helopeltis, Pestalozzia, Læstadia, *Cephaleuros virescens*, Nectria, Corticium, and Hypochnus on tea; *Corticium javanicum*, Colletotrichum, and *Hemileia vastatrix* on coffee; and diseases of unspecified causation, besides a number of insect enemies of cultivated plants.

A list of related publications issued in 1913 is also given.

Germination conditions of teleutospores of Uredineæ, III, P. Dietel (*Centbl. Bakt.* [*etc.*], *2. Abt., 42* (*1915*), *No. 25, pp. 698–705*).—In continuance of previous work (E. S. R., 28, p. 241), the author has found that spores of *Puccinia malvacearum* on mallow require for entirely normal development an atmosphere fully saturated with water vapor. It is stated that the period of exposure to unsaturated air necessary to complete loss of germinability is shortened as the humidity decreases.

Recent data and questions regarding smoke injury to plants, F. W. Neger (*Naturw. Wchnschr., 29* (*1914*), *No. 34, pp. 529–534, figs. 5*).—This is a condensed account, with a brief bibliography, of observations on gases injurious

to vegetation, some of which have already been noted (E. S. R., 34, p. 523), including such features as concentration, precipitation forms, soil factors, structural peculiarities, physiological relations, and temperature.

Examination and estimation of the damage caused to vegetation by the smoke and vapors from factories, F. RANWEZ (*Chem. News, 112 (1915), No. 2913, p. 151*).—This is a note on the injuries and problems arising in connection with the fumes, chiefly sulphur dioxid, from industrial plants.

A convenient casein spray, V. VERMOREL and E. DANTONY (*Rev. Vit., 42 (1915), No. 1091, p. 448*).—Directions are given for the convenient preparation of a solution which is said to keep indefinitely in closed vessels.

Powdered casein is dissolved in ten times its own weight of water, which is stirred rapidly in the meanwhile and also while about the same proportion of milk of lime is added.

To make a spray which possesses both adherent and spreading qualities the above preparation is added to 100 times its volume of alkaline Bordeaux mixture.

The use of copper carbonate as a fungicide, G. P. DARNELL-SMITH (*Agr. Gaz. N. S. Wales, 26 (1915), No. 3, pp. 242, 243*).—In order to avoid the possible bad effects of wetting the seed wheat in treating for bunt, the use of dry copper carbonate has been tested at the Wagga and Cowra experiment farms for two years with good results thus far as regards both germinability and freedom from bunt.

The method of applying the treatment was to shake up a bushel of the seed wheat in a bag with 4 oz. of copper carbonate. The powder readily adheres to the brush of the grain, where the bunt spores mostly adhere, and to the longitudinal groove of the seed.

Teleutospore formation by the cereal rust fungi, G. GASSNER (*Ztschr. Bot., 7 (1915), No. 2, pp. 65–120*).—Details are given of extended observations made in the subtropical regions of South America on the progress of teleutospore formation by *Puccinia triticina*, *P. graminis*, *P. coronifera*, and *P. maydis*, and on the developmental relations between host and fungus.

The dependence of teleutospore formation upon weather appears to be indirect and due to the part played by the weather in determining the developmental stages of the host. *P. graminis* requires, in order to begin the formation of teleutospores, a more advanced developmental stage in the host plant than do *P. triticina* and *P. coronifera*. *P. maydis* also depends upon the developmental stage of its host, as observable in varieties showing differences in developmental rates and in the periods required to reach the flowering stage.

Puccinia oryzæ parasitic on rice in the Ebro Delta, Spain, J. FLORENSA Y CONDAL (*Sindicato de Riegos del Delta Derecho del Ebro, la Enfermedad del Arroz (Puccinia oryzæ). Tarragona, 1914, pp. 32; abs. in Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases, 6 (1915), No. 3, pp. 469, 470*).—A destructive disease of rice which appeared in July, 1914, in the Ebro Delta is attributed to *P. oryzæ*. Its progress is thought to be favored by soil fatigue; high-water level; lack of care in selection and disinfection of seed; excess of nitrogen in fertilizers deficient in phosphates, potash, and iron; persistent humidity; cool weather during the period from germination to flowering of the rice; close planting; and the presence of weeds.

Remedial measures thus far have proved to be expensive and impracticable.

Preventive measures recommended include the burning of all vegetation on the ground after the removal of the straw, which should be disinfected with a 4–5 per cent solution of copper sulphate or with milk of lime; disinfection of the soil with lime or carbon disulphid; maintenance of a low water level (not over 7 or 8 in.); use of resistant varieties of rice, with constant selection there-

from; avoidance of suspected seed, or treatment thereof as directed; destruction of weeds on embankments; spacing from 10 to 14 in. apart; and rotation of crops or of varieties where possible.

[Report of the assistant in plant pathology], J. H. MUNCIE (*Michigan Sta. Rpt. 1915, p. 217*).—The author's investigations have been confined to a study of bean diseases, particularly in connection with measures for control of anthracnose and blight. It is believed that by growing early-maturing varieties of beans to a large extent the losses hitherto reported might be eliminated. Some experiments are being carried out to determine whether or not the bean disease organisms may winter over in the soil and attack the next year's crop.

Pseudomonas phaseoli in beans, W. GILTNER, C. W. BROWN, and S. T. SAPIRO (*Michigan Sta. Rpt. 1915, p. 208*).—On account of the possibility of seed bean infection, the authors have made an examination of the presence of bacteria causing bacteriosis of beans.

It was found that seed from diseased pods may or may not contain the causal organism, and that healthy-looking, clean beans from diseased pods may contain, a few weeks after ripening, from 100,000 to 3,000,000 bacteria per bean, while discolored ones may contain from 1,000,000 to 100,000,000 bacteria. Only 4 out of 27 discolored beans which had been kept for a year in a dry room showed the presence of living bacteria. As *P. phaseoli* was found to make fair growth on nutrient agar containing 2 per cent copper sulphate, the treatment of beans with copper sulphate is not considered of much value in the control of bean bacteriosis.

Phytophthora disease of gingseng, J. ROSENBAUM (*New York Cornell Sta. Bul. 363 (1915), pp. 63–106, figs. 17*).—The results are given of a study carried on in cooperation with this Department of the Phytophthora disease of ginseng, which was first reported in the United States by Van Hook (E. S. R., 18, p. 342) and which was studied by Hori in Japan (E. S. R., 19, p. 752). The symptoms of the disease, its cause, pathogenicity of the organism (*P. cactorum*), the life history, and the morphology of the fungus are described at length, after which results of experiments in control are given. Spraying with fungicides, removal of diseased tops or roots of plants, deep planting, crop rotation, sterilization of the soil, and adequate drainage are suggested.

Spraying of peanuts for leaf rust, W. NOWELL (*Agr. News [Barbados], 14 (1915), No. 352, p. 350*).—Information taken from a report by W. Robson regarding spraying for the control of peanut rust (*Uredo arachidis*) indicates that the fungus is effectively controlled by spraying with Bordeaux mixture, the yield being increased about 28 per cent in one instance.

The degree of infestation by this fungus depends largely upon conditions of soil and climate. Under favorable conditions only those leaves which are approaching senility are attacked, but unfavorable circumstances result sometimes in the death of the whole plant. This fact leads to varying results from spraying at different times and places.

Studies of health in potatoes, C. L. FITCH (*Colorado Sta. Bul. 216 (1915), pp. 3–31, figs. 17*).—On account of the serious losses experienced by potato growers in parts of Colorado, the author made an investigation of some of the factors which influence the health of the potato plant. Field and laboratory studies were made of soil temperature, moisture, irrigation, and the roots and leaves of the potato plant.

The conclusion was reached that high soil temperatures, which occur in years of more than average sunshine, and soakage of soil causing a lack of aeration are among the most important factors contributing to the loss. The presence of hyphæ of Fusarium was noted in unhealthy plants, but it is thought that the occurrence of the Fusarium is secondary to the effects produced by unfavorable

soil conditions. Leaf roll was widely reported in the potato districts of Colorado for several years, but it is thought to have almost completely disappeared in 1915.

[Infection of sugar beets through the seed], P. SORAUER (*Ztschr. Pflanzenkrank., 24 (1914), No. 8, pp. 449-462*).—This is a discussion of the various fungi and bacteria which are introduced into the soil with seed or mother beets, and the developmental relations between these organisms and their host plants.

Soil stain, or scurf, of the sweet potato, J. J. TAUBENHAUS (*U. S. Dept. Agr., Jour. Agr. Research, 5 (1916), No. 21, pp. 995-1002, pls. 2*).—The results are given of an extended study at the Delaware Experiment Station of the soil stain, or scurf, of sweet potatoes due to *Monilochætes infuscans* (E. S. R., 2, p. 416). This disease is said to occur in practically all sweet potato regions and is abundant in heavy soils, especially where manure has been used as a fertilizer. It is said to reduce the market value of the roots and also to reduce the yield by attacking the young roots and stunting their development. The fungus is said to be difficult to culture, as it is of very slow growth and readily overgrown by associated saprophytes. A description of the fungus as obtained from pure culture is given.

[Practical protection for plants], JUNGE (*Ber. K. Lehranst. Wein, Obst u. Gartenbau Geisenheim, 1913, pp. 27-30*).—American gooseberry mildew appears to have been dealt with effectively by careful removal of affected tips and thorough pruning with a view to light admission.

Fusicladium was not controlled by use of Bordeaux mixture or of lime sulphur.

The use of heating devices for preventing injury to orchard fruits was not effective when the temperature sank as low as —4° C.

Fire blight, L. R. TEHON (*Bien. Rpt. Wyo. Bd. Hort., 5 (1913-14), pp. 59-64, figs. 3*).—It is stated that fire blight (*Bacillus amylovorus*) is fast getting a hold upon the orchard district of Wyoming, practically every orchard in Crook County being infected in 1914.

The transmission, symptoms, and progress of the disease are discussed. Trees in vigorous growth, forming abundant new, succulent tissue, are particularly susceptible. The organism can not endure severe drying.

Continual inspection with destruction of all infected material constitutes the only available means of protection. The organism overwinters in the cankers on the fruit trees, and on mountain ash, service berry, and haw.

Dusting nursery stock for the control of leaf diseases, V. B. STEWART (*New York Cornell Sta. Circ. 32 (1916), pp. 10, figs. 5*).—On account of the reported success of dusting apple orchards for control of diseases the author has investigated the practicability of this treatment for the control of leaf diseases of cherry, rose, currant, and horse-chestnut. The dust mixture used in all the experiments was composed of 90 parts of finely ground sulphur and 10 parts of powdered lead arsenate. The results obtained were so successful that further trial on a more extensive scale is considered advisable.

The use of lime sulphur as a summer spray for apple scab, C. C. VINCENT (*Idaho Sta. Bul. 84 (1915), pp. 26, 27*).—A brief preliminary report is given of the results of spraying for the control of apple scab. Three applications of lime sulphur resulted in a crop 95 per cent of which was sound, as compared with 10 per cent from untreated trees. The applications were made when the buds began to show pink, when the petals fell, and four weeks later.

Plum wilt, its nature and cause, B. B. HIGGINS (*Georgia Sta. Bul. 118 (1916), pp. 3-29, figs. 25*).—A disease of Japanese plums and of hybrid varieties of Japanese parentage, known as wilt, is said to have been under observation

at this station for several years (E. S. R., 17, p. 466). In the fall of 1913 the author began a study to determine the identity of the organism, means of infection and spread of the disease, its course of development, and the possibility of control.

The cause of the wilt has been determined to be a species of Lasiodiplodia, to which the name *L. trifloræ* n. sp. has been given. The fungus infests principally the conducting tissue and the medullary rays of the wood, causing gum formation. The sudden wilting is considered due to a loss of water supply through the deposits of gum in the conducting elements of the wood. The fungus, it is said, can not enter through the unbroken bark, but readily enters through wounds, and a large proportion of the infections occur through wounds caused by peach borers.

For the prevention of this trouble, the author recommends the cleaning out of channels made by peach borers and removing, if necessary, the surrounding infected tissue, after which the surface is sterilized with corrosive sublimate and covered with grafting wax to prevent infection. Bacterial cankers and other wounds should be treated in the same manner.

[Control of plant diseases and insect enemies], G. LÜSTNER (*Ber. K. Lehranst. Wein, Obst u. Gartenbau Geisenheim, 1913, pp. 97–100*).—A brief discussion is given of tests made with several commercial preparations offered for use against Peronospora and Oïdium on grapevines and also against injurious insects.

Control of grape diseases, M. LINDNER (*Ztschr. Obst u. Gartenbau, 40 (1914), No. 7, pp. 101–104, figs. 4; abs. in Mycol. Centbl., 5 (1915), No. 6, p. 297*).—Directions are given for the employment of Bordeaux and Burgundy mixtures against *Peronospora (Plasmopara) viticola*, and of sublimed or powdered sulphur against *Oïdium tuckeri*.

The copper content of fungicidal sprays (*Rev. Vit., 42 (1915), No. 1092, pp. 469, 470*).—The copper content of Bordeaux and of Burgundy mixtures in common practice is said to have decreased from a concentration of about 8 per cent in the early stages of its employment to about 2 per cent at the present time. It is thought that the latter concentration should be employed, perhaps twice, about the time when the blooms are open, but that 1.5, 1, or even 0.5 per cent may be sufficient under ordinary conditions at other times.

[Fungicide injury and fungus control], FISCHER (*Ber. K. Lehranst. Wein, Obst u. Gartenbau Geisenheim, 1913, pp. 13–18*).—This report deals with injury to grape leaves and shoots by the use of Bordeaux mixture, and with experiments testing the efficiency of three proprietary preparations designed to control Peronospora and Oïdium, and of a fourth preparation claimed by a vine grower to give satisfactory results against these fungi.

[The use of fungicides against downy mildew], E. RABATÉ (*Jour. Agr. Prat., n. ser., 28 (1915), Nos. 45, pp. 378, 379; 46, pp. 392, 393; 47, pp. 407, 408*).—This is a discussion of factors to be considered in connection with the control of downy mildew of grape, including the weather and similar conditions (temperature, humidity, precipitation, drainage, etc.), resistant varieties, developmental stages of the host and parasite, the time and number of fungicidal applications as related to weather and growth, and the forms, compositions, and adaptations of the fungicides recommended.

Treatment of grape downy mildew as related to the period of blooming (*Rev. Vit., 42 (1915), No. 1091, pp. 447, 448*).—The period during which mildew attack is most to be dreaded is said to be that during which the flowers are newly opened and their tissues are moist and tender. The great losses suffered in 1913 in portions of Algeria were due to an outbreak during this period of susceptibility.

It is claimed that the two sprayings to be given, one just before and one just after this period, should have a copper sulphate content of 2 per cent and should be neutral rather than acid. Another treatment should be applied at about the end of the flowering stage. Each of these treatments should be supplemented by application of the fungicide in the form of a powder, preferably at the time when moisture or dew is present in order to secure adherence to the plants.

Advance notices regarding mildew outbreak, J. Capus (*Rev. Vit., 42 (1915), No. 1092, pp. 461–463*).—This is a discussion of the conditions and indications of mildew outbreak, and previous notices regarding the same, referring to the 1910 records in this connection.

Grape chlorosis (*Rev. Vit., 42 (1915), No. 1092, pp. 471, 472*).—The humid weather of the past spring is said to have resulted in the appearance of chlorosis in severe form, especially in grape stocks on soil, the lime content of which is near the limit of tolerance.

The application of iron sulphate by way of wounds, while efficacious, is said to be impracticable as a general measure. A 0.4 per cent spray of iron sulphate may be repeated two or three times without injury, a greater strength burning the leaves. Treatment must be prompt in order to be effective. In case it is thought advisable to combine a fungicidal treatment with that for chlorosis, a solution containing 1.5 per cent of lime with 1 per cent each of copper sulphate and iron sulphate is prescribed.

Carefully chosen American stocks are said to be resistant to the influence of these limy soils.

Mildew of raspberry fruits, A. Naumann (*Sächs. Ztschr. Obst u. Gartenbau, 40 (1914), pp. 121–123; abs. in Mycol. Centbl., 5 (1915), No. 6, pp. 293, 294*).—A mildew observed on raspberry fruits in Dresden appears to be due to *Sphærotheca pannosa.*

The mopo disease of young cinchona plants and the Javanese seed bed fungus, A. Rant (*Bul. Jard. Bot. Buitenzorg, 2. ser., No. 18 (1915), pp. 22, pls. 7*).—The author describes the study of a fungus causing a seed bed disease of cinchona called mopo in Java. The organism is thought to be identical with *Moniliopsis aderholdii.* It is said to be common in Java and to be favored by close planting in seed beds and by stagnation and humidity of the air, but to be opposed by alkalinity of the soil.

A bibliography is appended.

Cottony rot of lemons in California, C. O. Smith (*California Sta. Bul. 265 (1916), pp. 237–258, figs. 11*).—A description is given of the decay of lemons, commonly known as cottony rot or white mold, due to *Sclerotinia libertiana.* This disease is said to be widely distributed in the lemon-growing section of California and is characterized by a mass of white, cotton-like mycelial growth that rapidly spreads over the infected lemons. The affected tissue, while somewhat softer than normal, does not present the characteristics of a typical soft rot, as considerable firmness of the tissue may remain for some time. In advanced stages, however, the tissue becomes broken down and watery.

The life history of the fungus and the results of artificial inoculations are described. It has been found that the fungus attacks not only lemon fruit but the twigs of mature trees, nursery stock, and sweet and sour orange seed bed stock. The filaments of the fungus are able to enter and destroy a perfectly sound lemon at any point of contact, no abrasion being necessary. Attempts to inoculate the healthy, uninjured skin of a lemon with spores sprayed with an atomizer failed to give positive results except at the stem and blossom ends and rarely at points where two fruits were in contact. A study of strains of the fungus isolated from bean, cucumber, lettuce, vetch, wild lettuce, citrus

twigs, avocado twigs, tomato, and eggplant appears to indicate that these are identical with that causing the decay of lemon fruits described.

In a study of means for prevention of loss, disinfecting the fruits by the use of a wash water containing 0.02 per cent copper sulphate gave satisfactory results. Where this method is used, it is suggested that the wash water should be neutralized by the use of sulphuric acid before the copper sulphate is added to prevent the breaking down of the copper sulphate. Other important measures in controlling injury from this disease can be employed in the packing house, and the author recommends disinfection of storage boxes, frequent inspection, and the isolation of fruit that may have become infected by contact.

Die-back of lime trees in Montserrat (*Agr. News [Barbados], 14 (1915), No. 350, pp. 318, 319*).—Two fungi are said to be early and constantly present on diseased twigs of lime trees. One of these resembles the withertip fungus of citrus trees, *Colletotrichum glœosporioides*, as described by American writers, but the effects on leaves and fruits do not correspond so closely.

A Diplodia found on diseased branches is thought to be the same as that noted on cacao.

A disease of garden Arabis, R. LAUBERT (*Gartenflora, 63 (1914), No. 14, pp. 303, 304; abs. in Mycol. Centbl., 5 (1915), No. 6, p. 295*).—A disease of Arabis due to *Cystopus candidus* is reported at Berlin, this being supposedly its first appearance in Germany.

Rose mildew, KIESE (*Rosen Ztg., 29 (1914), p. 14; abs. in Mycol. Centbl., 5 (1915), No. 6, p. 298*).—Measures recommended as protective against rose mildew (*Sphærotheca pannosa*) are the selection of nonsusceptible varieties, avoidance of light sandy soils, and dusting several times during the early stages of growth with flowers of sulphur.

Control of rose mildew (*Ztschr. Obst u. Gartenbau, 40 (1914), No. 7, pp. 105, 106, figs. 3; abs. in Mycol. Centbl., 5 (1915), No. 6, p. 297*).—Brief discussion is given of machines for the employment of powdered sulphur for the control of rose mildew (*Sphærotheca pannosa*), with suggestions for the adaptation of the treatment to weather conditions.

Violet smut (Urocystis violæ), G. MÜLLER (*Prakt. Ratgeber Obst u. Gartenbau, 29 (1914), No. 7, p. 69, fig. 1; abs. in Mycol. Centbl., 5 (1915), No. 6, p. 296*).—In order to prevent the transmission of violet smut (*U. violæ*), which, it is said, may take place by means of cuttings, the use of seed only for propagation is recommended.

Recent observations on the blister rust of the Weymouth pine, C. VON TUBEUF (*Naturw. Ztschr. Forst u. Landw., 12 (1914), No. 9–10, pp. 484–491*).—The author follows up a previous report (E. S. R., 31, p. 50) with the statement that in 1914 *Peridermium strobi* developed abundantly in spite of severe attacks thereon by *Tuberculina maxima*. Study of this relation was carried forward by Lechmere, whose report appears below.

A continuation of a previous study (E. S. R., 31, p. 451) on the Ribes generation of this fungus has shown that infection occurs very sparingly, if at all, on the upper leaf surfaces, which bear no stomata, or on the petioles. Infection of the lower leaf surfaces by the æcidiospores was not prevented by the application of Bordeaux mixture to the upper surfaces.

Discussion is given of collected observations regarding the host plants, overwintering, dispersal, and developmental conditions of this fungus.

Tuberculina maxima, a parasite on the blister rust fungus of the Weymouth pine, E. LECHMERE (*Naturw. Ztschr. Forst u. Landw., 12 (1914), No. 9–10, pp. 491–498, figs. 2*).—An account is given of a biological study of *T. maxima*. It is stated that only negative results were obtained from the study,

referred to above, regarding the possibility of checking blister rust (*Cronartium ribicolum* or *Peridermium strobi*) on pine by employing for this purpose its parasite, *T. maxima*.

The dry rot question, MOORMANN (*Gsndhts. Ingen., 38 (1915), No. 18, pp. 211–214*)—This is a reply to Falck on the same subject (E. S. R., 33, p. 151).

ECONOMIC ZOOLOGY—ENTOMOLOGY.

Laws relating to fur-bearing animals, 1915, D. E. LANTZ (*U. S. Dept. Agr., Farmers' Bul. 706 (1916), pp. 24*).—A summary of laws in the United States and Canada relating to trapping, protection, propagation, and bounties.

Cottontail rabbits in relation to trees and farm crops, D. E. LANTZ (*U. S. Dept. Agr., Farmers' Bul. 702 (1916), pp. 12, figs. 5*).—A discussion of the damage caused by cottontail rabbits, and preventive and remedial measures therefor.

Further experiments on the effect of low temperatures on the frog, A. T. CAMERON (*Proc. and Trans. Roy. Soc. Canada, 3. ser., 8 (1915), Sec. IV, pp. 261–266*).—The data presented led the author to the following conclusions:

"The death temperature of *Rana pipiens* from cold is $-1.25° \pm 0.15°$ C. [$29.75° \pm 0.27°$ F.]. There is no climatic adaptation, nor any periodic adaptation due to hibernation, in *R. pipiens*. The cause of death is a specific temperature effect on the coordinating centers of the central nervous system. Those controlling lung respiration may be specially concerned. Frogs surviving degrees of cold such as those occurring during a Manitoban winter do so below the surface, near the margins of springs, and are themselves subjected to temperatures below the freezing point of water. There seems to be a slight variation in the death temperature from cold of different species of frogs, amounting to some tenths of a degree Centigrade. Frogs heated rapidly to normal room temperature from a temperature just below the freezing point of their body fluids (and not itself capable of causing death) are thrown into a peculiar hypersensitive condition, in which cessation of lung breathing takes place for long periods."

Snakes and their value to the agriculturist, R. W. SHUFELDT (*Sci. Amer. Sup., 80 (1915), Nos. 2082, pp. 344, 345, figs. 7; 2085, p. 393*).—Attention is called to the importance and value of snakes in the destruction of field mice. In a discussion of this paper which follows, W. H. McClellan reports field observations which indicate that the author's estimate of the number of mice consumed by a snake is much too high.

The cuticula of insects as a means of defence against parasites, W. R. THOMPSON (*Proc. Cambridge Phil. Soc., 18 (1915), No. 2, pp. 51–55*).—This is one of a series of papers reporting the results of studies of various biological questions connected with entomophagous parasites (E. S. R., 33, pp. 157, 855; 34, pp. 553, 557).

The interrelation of the phagocytes and parasites of arthropods, W. R. THOMPSON (*Bul. Soc. Zool. France, 40 (1915), No. 1–3, pp. 63–68, fig. 1*).—In continuation of the studies noted above the author presents the results of investigations of the phagocytic reaction in natural and experimental parasitism.

An improved collecting bottle, C. N. AINSLIE (*Psyche, 22 (1915), No. 6, pp. 211, 212*).

The calibration of the leakage meter, C. W. WOODWORTH (*California Sta. Bul. 264 (1916), pp. 231–234, fig. 1*).—It is pointed out that some leakage meters are so inaccurate that they are unsuitable for use as guides to dosage. The accuracy may be easily tested by measuring the clamp ring and the hole of the test plate. "Needles can be used to make test plates, making their meas-

urement unnecessary. The amount of the inaccuracy is determined by comparing the reading with a table. If found inaccurate the instrument should be returned to the maker for adjustment."

Thirtieth report of the state entomologist, 1914, E. P. FELT (*Univ. State N. Y. Bul. 606 (1916), pp. 336, pls. 19, figs. 101*).—In the first part of this report the author refers briefly to the work of the year and the more notable events. The injurious insects, next considered, include the lined red bug (*Lygidea mendax*), the species responsible for most of the red bug damage to apple orchards in the Hudson Valley; white grubs and May or June beetles; forest tent-caterpillar; brown tail moth, an infestation of which was found on Fishers Island, Gardners Island, and the eastern end of Long Island; army worm; European pine shoot moth (*Evetria buoliana*) which has become established in several localities in New York State; box leaf midge (*Monarthropalpus buxi*), which has become thoroughly established on Long Island and is seriously injuring box hedges; and grasshoppers, a serious outbreak of which occurred on the sandy areas bordering the Adirondacks.

Under the heading of Notes for the Year (pp. 58–91) the author records observations on some of the more injurious or interesting species coming to notice. The fruit insects mentioned include the tent caterpillar; lime tree winter moth; green fruit worm; pear thrips; pear midge (*Contarinia pyrivora*); pear psylla; banded grape bug (*Paracalocoris scrupeus*), a description of the early stages of which are given; spotted winged Idiocerus (*Idiocerus maculipennis*); and San José scale. Several grass and garden insects are considered, namely, grass webworms (*Crambus luteolellus*); yellow field ant (*Solenopsis debilis*); Say's blister beetle (*Pomphopœa sayi*), unusually abundant and injurious in several localities in the State; juniper plant bug (*Chlorochroa uhleri*); and Iris borer (*Macronoctua onusta*). Those mentioned as having injured ornamental and shade trees are the European hornet (*Vespa crabro*), which attracted attention through its gnawing off the bark from the small branches of various trees, especially birch; the elm leaf beetle (*Galerucella luteola*); the gipsy moth, a colony of which was discovered at Mt. Kisco; Norway maple leafhopper (*Alebra albostriella*) and scurfy scale (*Leucaspis japonica*) on Norway maple, hitherto regarded as comparatively free from insect pests; pine leaf scale (*Chionaspis pinifoliæ*); spruce bud scale (*Physokermes piceæ*), which has become established in several widely separated districts of the State; the false maple scale (*Phenacoccus acericola*); and mulberry white fly (*Tetraleyrodes mori*). The forest tree pests noted include the spruce bud moth (*Tortrix fumiferana*), ugly nest cherry worm (*Archips cerasivorana*), maple and oak twig pruner (*Elaphidion villosum*), and periodical cicada. Several miscellaneous pests are also mentioned.

A list prepared by F. T. Hartman of the Coccidæ in the collection of the New York State Museum, consisting of 173 species of which 46 were found in New York, is next presented (pp. 92–109). This is followed by lists of publications of the entomologist and additions to the collections. Part 3 of A Study on Gall Midges, or Itonididæ (E. S. R., 33, p. 253), which deals with the tribes Porricondylariæ and Oligotrophiariæ and is illustrated by a number of plates, is appended.

[Entomological work in Porto Rico] (*Rpt. Bd. Comrs. Agr. P. R., 3 (1914), pp. 9–55*).—Several reports of work carried on in Porto Rico are presented, namely, Report of the Quarantine Inspection Work, by R. J. Fiske (pp. 14–19); Report of the Department of Entomology, by T. H. Jones (pp. 19–25); Report of the Traveling Entomologist, by G. N. Wolcott (pp. 25–40); Report of Work at the South Coast Laboratory, by E. G. Smyth (pp. 40–53); and Progress Report on Investigations Relative to the Horn Fly, by G. B. Merrill (pp. 53–55).

The report of the traveling entomologist considers details relating to the work of collecting white-grub parasites (*Tiphia inornata* and tachinid species). In collecting material the author has found that the females of *Lachnosterna implicata*, the most common species in Illinois, feed largely on the leaves of cottonwood and willow. Since they do not fly far after feeding before ovipositing, large numbers of larvæ are most often found in fields near such trees.

An account is also presented of a trip to Cuba and Jamaica made during the winter of 1914 for the purpose of investigating sugar-cane insects and their enemies, especially the sugar-cane borer (*Diatræa saccharalis*) and the root borer (*Præpodes vittatus*). The author found the sugar-cane borer apparently less common in Cuba than in Porto Rico and Louisiana. A tachinid fly (*Tachinophyto* [*Hypostena*] sp.) was found to be the most important larval parasite of *D. saccharalis* in Cuba. It was found abundant in nearly every field in which the borer was present, and it is estimated that 25 per cent of the borer larvæ in Cuba, half grown or larger, are parasitized by this tachinid. A similar species occurs in Jamaica. Several predaceous larvæ of an elaterid beetle were found in the borer tunnels at Chaparra. Other important insect enemies of cane observed in Cuba are the mealy bug (*Pseudococcus* sp.), *Solenopsis geminata*, the weevil stalk borer (*Metamasius sericeus*), the West Indian sugar-cane leafhopper (*Delphas saccharivora*), and the root borer *Diaprepes abbreviatus*.

In Jamaica it was found that the root borer *P. vittatus*, previously an important sugar-cane pest, but which is parasitized by *Elis atrata*, has not been abundant in recent years. The fact that the sugar-cane borer is generally less abundant in Cuba and Jamaica than in Porto Rico and Louisiana is due in part to parasitism by tachinid flies, the general practice of not burning trash which favors the effectiveness of the egg parasite *Trichogramma minutum*, care in planting seed free from Diatræa larvæ, and sanitation in harvesting cane, that is, cutting close to the ground and destruction of injured stalks.

The report of work at the south coast laboratory deals with the injury by beetles and by white grubs, species responsible for injury, injury by other scarabæids, field habits of Lachnosterna, laboratory work with Lachnosterna and related Scarabæidæ, control of white grubs, and release of parasites in Porto Rico.

[Report of the] division of entomology and zoology (*Washington Sta. Bul. 127 (1915), pp. 30–38, figs. 2*).—The investigations in Washington State have shown that differences in the viability of scale insects are not due so much to the strength of the spray employed as to the locality where the spraying is done. There was found to be a much greater difference in the effect produced by a single spray at Wenatchee and Clarkston than between the effect of an excessively strong spray as compared with an excessively weak spray used at either place alone. See also a previous note by Melander (E. S. R., 34, p. 551).

It is stated that the Colorado potato beetle has now become acclimated to conditions in eastern Washington and is proving to be as destructive there as elsewhere. Brief reference is made to the study of endoparasites of the cabbage aphis and other insects, and brief reports are given of the work with root maggots and the Columbian ground squirrel. The data secured in investigations have shown beyond doubt that there is but one brood per year of the Columbian ground squirrel, and for this locality the litter appears above the surface about the first to the tenth of May.

[Report of entomological work], J. S. Dash (*Rpt. Dept. Agr. Barbados, 1913–14, pp. 37–43*).—The author reports upon the occurrence of the more important insects of the year in Barbados and work therewith.

[Summary of investigations of the division of entomology], D. D'EMMEREZ DE CHARMOY (*In Summary of Investigations Made During the Period January 1 to June 30, 1915. Mauritius: Dept. Agr., 1915, pp. 3–7*).—A brief report of the occurrence of and work with the more important insects in Mauritius.

Cassava insects, F. W. URICH (*Bul. Dept. Agr. Trinidad and Tobago, 14 (1915), No. 2, pp. 38–40*).—The author calls attention to some of the insects found on cassava in Trinidad and Tobago which may become pests.

Insects injurious to stored grains in Mauritius, D. D'EMMEREZ DE CHARMOY (*Dept. Agr. Mauritius, Sci. Ser., Bul. 2 (1915), [English Ed.], pp. 16, pls. 3*).—Brief accounts are given of three insects attacking maize, namely, the rice weevil, the maize beetle or bamboo borer (*Didoncrus minutus*), and the maize tineid; two attacking rice, the rice weevil and rice moth (*Ephestia cahiritella*); three attacking the seeds of leguminous plants, the bean weevil, cowpea weevil, and four-spotted weevil (*Bruchus quadrimaculatus*); and three attacking bran, flour, and other foodstuffs, namely, the saw-toothed grain beetles (*Sylvanus signatus* and *S. surinamensis*) and the flour beetle (*Tribolium ferrugineum*).

Insect-borne diseases in Pan-America, J. GUITERAS (*Havana: Dept. Health and Charities Republic Cuba, 1915, pp. 42, pl. 1, figs. 2*).—This paper, read before the Second Pan-American Scientific Congress, held in Washington, D. C., December 27, 1915, to January 8, 1916, reviews the subject at some length and presents a classified bibliography of 156 titles.

Termites, or "white ants," in the United States: Their damage and methods of prevention, T. E. SNYDER (*U. S. Dept. Agr. Bul. 333 (1916), pp. 32, pls. 15, figs. 5*).—A general account of termites, particularly *Leucotermes flavipes*, *L. virginicus*, and *L. lucifugus*, their life history and bionomics, geographical distribution, economic importance in the United States, and preventive and remedial measures.

The apple red bugs (Heterocordylus malinus and Lygidea mendax), C. R. CROSBY (*New York Cornell Sta. Bul. 291, rev. ed. (1915), pp. 213–230, figs. 28*).—A revised edition of the bulletin previously noted (E. S. R., 25, p. 255).

A serious attack of Jassus sexnotatus on autumn rye, in the autumn of 1914, H. VON FEILITZEN (*Landtmannen, 26 (1915), No. 19, pp. 169–172, figs. 4; abs. in Rev. Appl. Ent., 3 (1915), Ser. A, No. 9, pp. 525, 526*).—An outbreak of this pest in a field of fall rye at Jönköping, Sweden, is reported, this being the first record of its injury to the crop in Sweden.

Life history of Vanduzea arquata, W. D. FUNKHOUSER (*Psyche, 22 (1915), No. 6, pp. 183–198, pl. 1*).—The life history studies of this membracid, one of the most widely distributed in the United States, are based upon field notes made during the past five summers in the vicinity of Ithaca, N. Y., where the species is very abundant upon the locust (*Robinia pseudacacia*).

The periodical cicada in Missouri, L. HASEMAN (*Missouri Sta. Bul. 137 (1915), pp. 3–33, figs. 27*).—A general account of its life history and bionomics, followed by an illustrated discussion of the distribution of broods of periodical cicada in Missouri.

Morphology and biology of the green apple aphis, A. C. BAKER and W. F. TURNER (*U. S. Dept. Agr., Jour. Agr. Research, 5 (1916), No. 21, pp. 955–994, pls. 10, figs. 3*).—The authors report in detail upon studies of the life history of *Aphis pomi* which were commenced in 1913 and carried on at Vienna, Va., The outline of the life history prepared by the authors is as follows:

"The egg is laid upon the tender twigs of the apple, though occasionally it is laid upon the bark of the older twigs. It is light yellow when laid, but later changes to shining black. Development for a few days is very rapid, after which the egg rests for the winter. When the revolution of the embryo is completed in the spring, an increase in temperature will cause the egg to hatch.

Before this revolution a high temperature only tends to destroy it. Early in April the egg hatches by a uniform splitting over the insect's head.

"The stem mother is wingless and becomes mature in about ten days. She produces summer forms, both winged and wingless, with the winged ones predominating. There are 9 to 17 generations of the summer forms at Vienna, Va. After the second generation the wingless forms always outnumber the others, but winged forms may occur in every generation. They become rare toward the end of the season. On the other hand, a wingless line may be carried from the stem mother to the egg. A third form, the intermediate, may occur throughout the summer. The wingless sexes begin to appear about the first of September. They occur in all generations, from the eleventh to the nineteenth, inclusive, and probably also in the ninth and tenth. The summer wingless forms and the oviparous females, which live longer than the males, remain on the trees at Vienna, Va., until the leaves drop, usually about the middle to the last of November.

"Mating commences toward the close of September, one male usually serving more than one female. Both sexes feed. The oviparous female may lay infertile eggs if not reached by a male, and these eggs do not become black. The fertile egg develops to the resting stage before the first heavy frosts; otherwise it may be winterkilled and will not hatch to a stem mother the following spring."

A genealogical diagram which accompanies the paper shows the forms and generations developing from one stem mother of the green apple aphis as indicated by the authors' breeding experiments.

Experiments with sprays against Aphis papaveris, Sofie Rostrup (*Tidsskr. Planteavl, 22 (1915), No. 2, pp. 233–256; abs. in Rev. Appl. Ent., 3 (1915), Ser. A, No. 9, pp. 526, 527*).—Experiments with nicotin sprays for the control of *A. rumicis* (*papaveris*) on seed turnips and horse beans conducted in 1913–14 showed 0.1 per cent nicotin to be sufficient, and when the attack is not serious even less may be used, although 0.05 per cent is probably too weak. "*Macrosiphum* (*Siphonophora*) *pisi*, a large species often occurring in company with *A. rumicis*, is more resistant to the spray. Coccinellids in all stages, *Sitones lineatus*, and thrips were found alive on the plants, whereas *Lygus campestris* was killed."

The leopard moth: A dangerous imported insect enemy of shade trees, L. O. Howard and F. H. Chittenden (*U. S. Dept. Agr., Farmers' Bul. 708 (1916), pp. 10, figs. 4*).—A revision of Bureau of Entomology Circular 109, previously noted (E. S. R., 21, p. 458).

The catalpa sphinx, L. O. Howard and F. H. Chittenden (*U. S. Dept. Agr., Farmers' Bul. 705 (1916), pp. 9, figs. 5*).—A revision of Circular 96 of the Bureau of Entomology, previously noted (E. S. R., 19, p. 759).

The fruit-tree leaf roller (Archips argyrospila), G. W. Herrick and R. W. Leiby (*New York Cornell Sta. Bul. 367 (1915), pp. 247–279, figs. 18*).—In addition to the data presented in Bulletin 311 (E. S. R., 27, p. 160) and in a paper (E. S. R., 34, p. 63) previously noted, the authors report control experiments carried on from 1911 to 1914.

The experiments have shown that the eggs of the leaf roller are susceptible to the effect of miscible oils, which, when thoroughly applied, have destroyed from 74 to 92 per cent. "In experiments made during the last three years no injury has resulted from the use of miscible oils. The oils have been applied in the spring (April) at as near the active growing period of the tree as possible, but always before the buds burst. They have been used generally at the

rate of 1 gal. to 15 gal. of water. Only one application should be made, and that on a day when the temperature is above freezing.

"In cases of severe infestation the oils should be supplemented by thorough sprayings with arsenate of lead at the rate of 6 lbs. to 100 gal. of water or of lime-sulphur solution. At least one application should be made before the blossoms open, and another after the petals fall; the latter will serve also as the regular spraying for codling moth. In lightly infested orchards spraying with miscible oils may be omitted and reliance placed on thorough applications of arsenate of lead, at the rate of 6 lbs. to 100 gal. of water or lime-sulphur solution. One or two applications should be made before the blossoms open and another after the petals fall."

The bagworm, an injurious shade tree insect, L. O. HOWARD and F. H. CHITTENDEN (*U. S. Dept. Agr., Farmers' Bul. 701 (1916), pp. 11, figs. 13*).—A revision of Circular 97 of the Bureau of Entomology, previously noted (E. S. R., 19, p. 860).

The cranberry girdler and its control, H. B. SCAMMELL (*Proc. Amer. Cranberry Growers' Assoc., 46 (1915), pp. 4–6*).—The observations of the season are said to have led to the conclusion that there is only one annual brood of the cranberry girdler (*Crambus hortellus*).

Observations on respiration of Culicidæ, S. K. SEN (*Indian Jour. Med. Research, 2 (1915), No. 3, pp. 681–697, pls. 4, figs. 4*).—A report of observations on the consumption of oxygen and evolution of carbon dioxid by mosquitoes.

Notes on five North American buffalo gnats of the genus Simulium, A. W. JOBBINS-POMEROY (*U. S. Dept. Agr. Bul. 329 (1916), pp. 48, pls. 5, figs. 15.*—Morphological and biological studies are here presented. The various stages of the simulids, their life cycle and number of generations, insect enemies and parasites are dealt with. The Simulium as a possible carrier of disease is also considered.

A bibliography of 14 pages arranged in alphabetical order is appended.

Sarcophagid larvæ from the painted turtle, F. E. CHIDESTER (*Jour. Parasitology, 2 (1915), No. 1, pp. 48, 49, figs. 2*).—The author records having reared several sarcophagid larvæ from the painted turtle (*Chrysemys picta*) at New Brunswick, N. J.

A new generic name for the screw worm fly, C. H. T. TOWNSEND (*Jour. Wash. Acad. Sci., 5 (1915), No. 20, pp. 644–646*).—The author erects the genus Cochliomyia for the screw worm fly, which has been known as *Chrysomyia macellaria.*

Life history studies of the Colorado potato beetle, PAULINE M. JOHNSON and ANITA M. BALLINGER (*U. S. Dept. Agr., Jour. Agr. Research, 5 (1916), No. 20, pp. 917–926, pl. 1*).—This is a report of experiments conducted in the District of Columbia during the season of 1914, during which time the temperature was exceedingly high with more than the normal rate of humidity. The data are presented largely in tabular form under the headings of generation experiments, number of molts and duration of instars, and fall mating for spring egg laying.

Observations on the life history of the cherry leaf beetle, G. W. HERRICK and R. MATHESON (*U. S. Dept. Agr., Jour. Agr. Research, 5 (1916), No. 20, pp. 943–950, pls. 2*).—The authors report from the New York Cornell Experiment Station that several severe outbreaks of the cherry-leaf beetle (*Galerucella cavicollis*) occurred in New York State during the summer of 1915, in which the adult beetles defoliated cherry, peach (*Amygdalus persica*), and plum. Practically all the injury was restricted to the western and southwestern part of the State.

In the present paper they first present a historical review, after which the life history and habits are briefly dealt with. This beetle is widely distributed,

occurring from Canada, through the New England States southward into Pennsylvania, and west to Wisconsin. It is also said to have been recorded from Texas and Vancouver, British Columbia, while the original specimen was described from North Carolina. In New York State there is only a single brood each season, the new brood of adults appearing during the second week in August and becoming common during the latter part of the month and early September. At Ithaca oviposition takes place from June to August. The larvæ, which hatch out in from 14 to 18 days, make their way from the branches to the young and tender foliage near the tips of the twigs, where they feed ravenously and reach maturity in from two to three weeks. Where the larvæ are abundant all the foliage may be so completely skeletonized as to turn brown and die, giving the trees a scorched appearance. A close examination about Ithaca failed to detect the presence of larvæ on any trees but the pin cherry. Pupation is said to take place at or slightly below the surface of the soil.

Due to scarcity of material, control experiments have not been conducted by the authors, but correspondents have reported good success from the use of arsenate of lead paste at the rate of 4 to 5 lbs. to 100 gal. of water and also from a spray containing 40 per cent of nicotin.

The tobacco wireworm, C. Bencomo (*El Pasador del Tabaco. Port au Prince, Haiti: Author, 1915, pp. 13, pl. 1; abs. in Rev. Appl. Ent., 3 (1915), Ser. A, No. 9, p. 525*).—*Agriotes* (*Elater*) *segetis*, known as an enemy of cereals and vegetables, attacks the roots of the tobacco plant in Cuba, where it is termed the tobacco wireworm. The present paper gives a brief account of its life history and control measures.

The corn stalk beetle, R. W. Harned (*Mississippi Agr. Col. Ext. Serv. Press Circ., 1915, June 19, folio.*)—The author reports complaints from many parts of Mississippi of injury to corn by the corn stalk or sugar cane beetle (*Ligyrus rugiceps*), an account of which by Titus (E. S. R., 17, p. 781) has been noted. It is pointed out that while it does some damage every year, it was apparently much worse during the spring of 1915 than during any previous year of which there is record, with the possible exception of 1904, as reported by Herrick (E. S. R., 17, p. 265). Several remedial practices are recommended.

The effect of cyanid on the locust borer and the locust tree, W. P. Flint (*Science, n. ser., 42 (1915), No. 1090, pp. 726, 727*).—The author, from the Illinois state entomologist's office, reports experiments carried on in central and northwestern Illinois early in the spring in which from 0.05 to 0.5 oz. of 98 per cent potassium cyanid and of cyanid-chlorid carbonate mixture (guarantied to contain from 35 to 38 per cent sodium cyanid) was introduced into 50 black locust trees of from 1 to 7 in. in diameter. The cyanid was inserted in the trees in auger holes of 0.25, 0.5, 0.75, and 1 in. in diameter, bored at different heights from the ground and different depths into the trunk.

Of 42 trees located in July, 23 were dead and 19 alive, all but 3 of the latter being infested with living larvæ of *Cyllene robiniæ*. "In several cases living borers were found directly above and within 6 in. of the auger holes, and in 3 cases the borers were within 1 in. of the auger holes. Not only were the borers alive in the living trees, but in all cases where the trees had put forth leaves in the spring of 1915 living borers were present in numbers in the trunks, and could be found around the bases of the trunks of many of the trees that had not shown foliage the past spring. Not a single dead borer was found near the points where the cyanid had been placed.

"While over half of the trees treated were dead, this was not entirely due to the effects of the cyanid, as at least 25 per cent of the untreated trees in both groves had died from the effects of borer injuries. There can be no doubt, however, that the cyanid had a very injurious effect on the trees, as in all the

living trees the bark was dead and the wood discolored for a greater or less distance around the holes where the cyanid had been placed."

Farm beekeeping, E. E. TYLER and L. HASEMAN (*Missouri Sta. Bul. 138 (1915), pp. 3–40, figs. 20*).—This is a general account of the honeybee and beekeeping. Receipts for the use of honey are included.

The olfactory sense of the honeybee, N. E. McINDOO (*Jour. Expt. Zool., 16 (1914), No. 3, pp. 265–346, figs. 24*).—In the investigation here reported the author had two objects in view: (1) The determination of the relative sensitiveness of the honeybee to different odors, so that it may be expressed numerically for comparison under different conditions; and (2) the location of the olfactory organs. Experiments were conducted with normal bees and mutilated bees in observation cases, and a study was made of the morphology of the olfactory pores.

"Bees have a very acute sense of smell. This sense is most highly developed in the drones and least developed in the queen, while that of the worker is scarcely inferior to that of the drone. Olfactory pores are found on the bases of all four wings, widely scattered on the trochanter and at the proximal ends of the femur and tibia of all six legs, on the second and third tarsal joints of most legs, and generally distributed on the shaft and lancets of the sting. Each pore is a chitinous structure connected with a bipolar sense cell, the peripheral end of which comes into direct contact with the external air. Such sense cells are met with in all insects, for Künckel and Gazagnaire (1881) assert that bipolar sense cells are common to all insects."

Parasitism among the larvæ of the Mediterranean fruit fly (Ceratitis capitata) in Hawaii during 1914, E. A. BACK and C. E. PEMBERTON (*[Bien.] Rpt. Bd. Comrs. Agr. and Forestry Hawaii, 1913–14, pp. 153–161*).—This paper includes tabular data on the rearing of parasites from coffee (see E. S. R. 32, p. 757), Chinese oranges, and strawberry guava. The authors found a parasitism of from 29 to 53.8 per cent among pupæ from the strawberry guava (*Psidium cattleyanum*) in Honolulu in July, 1914. *Opius humilis*, introduced from South Africa and first liberated on the island of Oahu in November and December, 1913, appears to be largely responsible for the noticeable decrease of the fruit fly.

On some genera of the pimpline Ichneumonidæ, J. H. MERRILL (*Trans. Amer. Ent. Soc., 41 (1915), No. 2, pp. 109–154, pls. 3*).—A systematic study of the genera Megarhyssa, Rhyssa, Apechoneura, and Pseudorhyssa with 14 species. One genus and species, *Pseudorhyssa sternata*, are described as new to science.

Sugar cane borer parasites and control of borers, P. VAN DER GOOT (*Meded. Proefstat. Java-Suikerindus., 5 (1915), No. 4, 125–176, pls. 3; abs. in Rev. Appl. Ent., 3 (1915), Ser. A, No. 7, pp. 382–386*).—In Java the borers are the most important enemies of sugar cane. In the present paper four species, namely, the striped stalk borer (*Diatræa striatalis*), the yellow tip borer (*Chilo infuscatellus*), the white tip borer (*Scirpophaga intacta*), and the gray borer (*Olethreutes [Grapholitha] schistaceana*), and their parasites are dealt with at length.

A list of Tenthredinidæ collected in the Luga district of the Government of Petrograd and some biological observations on them, V. PADALKA (*Russ. Ent. Obozr., 14 (1915), No. 4, pp. 460–472; abs. in Rev. Appl. Ent., 3 (1915), Ser. A, No. 7, p. 389*).—A list is given of 108 species of Tenthredinidæ and 5 of Lydidæ collected near Luga, in the Government of Petrograd, together with host plants and a more or less full account of their life histories.

Two strawberry slugs, R. L. WEBSTER (*Iowa Sta. Bul. 162 (1915), pp. 3–20, figs. 11; popular ed., pp. 4, figs. 3*).—The early strawberry slug (*Empria fragariæ*) and the late strawberry slug (*E. maculata*) are here considered, the first having

at times been abundant and very destructive in Iowa. Both of these slugs in their older satges cause similar injury to strawberry through eating out more or less irregular holes in the foliage, often leaving it ragged and with little more than the midrib and some of the larger veins untouched. Besides the holes in the leaves, damaged foliage has frequently a browned and dried appearance, due to the work of the young slugs, which at first eat only the outer part and not clear through the leaves. When first hatched the early strawberry slugs begin to feed on the upper surface of the leaves. The newly hatched slugs of the later species begin their feeding on the lower leaf surface.

Brief accounts are given of both species, including their past history, classification, generations, several stages, and natural enemies.

"An application of lead arsenate paste, at the rate of 2 lbs. in 50 gal. of water (or powdered lead arsenate, 1 lb. in 50 gal.), put on immediately before blossoming, will control the early strawberry slug. Powdered zinc arsenite, 1 lb. to 100 gal. of water is also effective. . . . Should the late strawberry slugs become destructive, an application of hellebore would probably check them, this applied at the rate of 1 lb. in 50 gal. of water."

FOODS—HUMAN NUTRITION.

Chemical and physical constants for wheat and mill products, E. F. Ladd (*North Dakota Sta. Bul. 114 (1916), pp. 272–297, figs. 9*).—This bulletin summarizes a large amount of experimental data regarding the varieties of wheat grown in the State and the climatic and soil influences on their milling and baking value. About 660 complete trials were made with North Dakota grown wheat during the period 1907–1914.

The average amount of screenings found in 652 samples of wheat was 3.99 per cent, but 83 of the samples examined contained more than 30 per cent. These screenings consisted chiefly of shrunken and broken particles of wheat, dirt, weed seed, wild oats, etc., and according to the analyses reported constitute a valuable stock feed.

The average loss in milling in 665 trials, representing all classes and grades of wheat, was 2.24 per cent. Six hundred and sixty-one samples of wheat of all grades showed an average flour production of 68.82 per cent, and of these samples 210 gave a yield of 70 per cent or better. The bran contained in 649 samples amounted to 12.71 per cent on an average, and the amount of shorts in 651 samples 15.15 per cent.

Baking tests with 646 samples of flour produced from all classes and varieties of wheat showed the average loaf volume to be 2,343 cc.

Milling tests were made to determine the yields of flour, bran, and shorts for the different varieties and grades of wheat by years. These showed that "in general the percentage of flour produced from the several brands follows the same general curve; that is, the variation in the percentage of flour seems to be due more largely to climatic or seasonal differences than to variety differences. The diagram for the percentage of flour produced for the several varieties clearly indicates this. In general, Velvet Chaff produced a lower percentage of flour than any of the varieties, although at the same time it produced the maximum percentage. There is very little difference between the Fife and Bluestem, and it is interesting to note that for the period of 8 years durum wheat has averaged only slightly lower in percentage of flour than the other varieties."

Data are given regarding the moisture in the wheat before and after tempering and also in the flour; the protein in the wheat by grades and years and in the flour; color scores; the absorption of water; baking tests; and wheat and flour prices. As regards bread-producing qualities, "more than 650 tests, divided among the several varieties of wheat and for the different grades of each

variety, did not show any very marked variation in loaf volume for the different grades. As a whole, the Bluestem averaged slightly higher in loaf volume than either of the others. Velvet Chaff was equal to the Fife, while durum fell considerably below. The color and texture of all were good. The mean for all the tests of each variety furnishes a fair basis for comparison."

Analyses of wheats and flours, J. C. BRUNNICH (*Ann. Rpt. Dept. Agr. and Stock [Queensland], 1914–15, pp. 54–61*).—Data are given regarding the composition of a large number of samples of wheat and flour, the appearance of the grain and gluten being included.

The digestibility of bran, M. HINDHEDE (*Skand. Arch. Physiol., 33 (1915), No. 1–3, pp. 59–80; abs. in Zentbl. Physiol., 30 (1915), No. 12, p. 561*).—In the author's opinion, the nutritive value of bran is such that it is a mistake to use it in times of need for animal feeding.

Do present practices in bread making conform with the biochemical teachings of human nutrition? J. STOKLASA (*Deut. Med. Wchnschr., 42 (1916), No. 3, pp. 75–77*).—The author compares the chemical composition and nutritive values of pure rye bread, bread made from 80 per cent of rye flour and 20 per cent of specially prepared bran, and bread containing 70 per cent rye flour and 30 per cent bran.

Digestion experiments in vitro indicated that the protein in bread made with 30 per cent bran was as thoroughly digested as that of the pure rye bread. It is the opinion of the author that bran, which is rich in protein and organic phosphorus compounds, should be milled in such a way as to make these food constituents available to the body and incorporated in all flour used for bread making.

The bacterial examination of sausages and its sanitary significance, W. E. CARY (*Amer. Jour. Pub. Health, 6 (1916), No. 2, pp. 124–135*).—The significance of the bacterial content of sausages is discussed in the light of work of other investigators, mostly German and French.

The investigation here reported was carried out to determine the number of bacteria present and the factors influencing it; the prevalence of fecal or pathogenic organisms; the presence of adulterants and preservatives; and the influence of sanitary marketing and of cooking on the bacterial content. Thirty-four samples of sausage, purchased under the usual conditions found in the markets of Chicago, were examined; at the time of purchase each market was scored on the sanitary surroundings, method of handling and exposure of the meat, general cleanliness, and facilities for refrigeration. Determinations were made of the total numbers of bacteria per gram of meat, developing at 37° C. in 24 hours and at 20° in 48 hours, and also of the numbers of *Bacillus coli* and organisms forming gas with dextrose.

From the results of these tests, which are reported in detail, the author concludes that "the number of bacteria per gram of sausage varies so widely that little importance can be attached to the bacterial count alone. Many factors, such as the precautions used in manufacture, proper handling in the shops, and the presence of preservatives may influence the count greatly."

The following organisms, among others, were isolated from the 34 samples examined: *B. coli*, 30 times; *Proteus vulgaris*, 11 times; *B. paracoli* (organism resembling *B. paratyphosus* morphologically and culturally but not agglutinated by either paratyphoid of enteritidis serum), 9 times; *B. fecalis*, 8 times; yeast, 8 times; Streptococcus, 5 times; and *Staphylococcus aureus*, 2 times.

Each of the samples was examined for starch adulteration. Cornstarch was very commonly used in a very finely ground condition. It was present in 56 per cent of all samples, and in 26 per cent of the samples 5 per cent or over was found. It was noted that starch was present in 77 per cent of the samples pur-

chased in the poorer districts, and in only 38 per cent of the samples from the more sanitary shops, and that the price per pound in these districts was 13 to 15 cents and 18 to 25 cents, respectively.

In an attempt to determine the influence of sausage casings on the bacterial content the scrapings from the interior of the casings from 7 samples were examined in parallel with the interior contents of the same sausage. As a result of this test the conclusion is drawn that "skins used as casings, if properly prepared, can not be considered to increase the bacterial count or the danger from pathogens."

Sulphites were found in 7 of the 13 samples tested for the presence of this preservative.

Six samples of pork sausage were cooked in various ways in the laboratory to determine the effect of household methods of cookery upon the bacterial content. Four samples of sausage cooked in restaurants were also examined bacteriologically as an index of the efficiency of ordinary restaurant cooking. It was found in general that cooking destroyed a very large percentage of the bacteria, and that extra well-cooked sausages were sterile. The efficiency of cooking varied only within the limits of 93.3 per cent and 100 per cent.

The composition and evaluation of boullion cubes, G. Kappeller and A. Gottfried (*Ztschr. Untersuch. Nahr. u. Genussmtl., 31 (1916), No. 1, pp. 1–6*).—Analytical data are reported showing the composition of 35 samples of boullion cubes. The following variations in percentage composition were noted: Water, 10.0–1.1; protein, 26.9–0.43; phosphoric acid, 1.43–0.25; ash, 83.7–56.85; sodium chlorid, 83.3–53.7; total creatinin, 1.2–0.0; fat, 9.6–0.0; and sugar, 14.7–0.0 per cent.

Mushrooms as food, W. Bruhn (*Gartenflora, 64 (1915), No. 21–22, pp. 353–364, figs. 3*).—Analytical data are given comparing the composition of mushrooms with that of many more common foods.

Poisoning by mushrooms, S. Chauvet (*Les Empoisonnements par les Champignons. Paris: Le François, 1915, pp. 59, pls. 4, figs. 2*).—The author brings together in this book information concerning the causes of occasional poisoning by fungi, and the diagnosis and treatment of such cases. The botanical characteristics of some very poisonous varieties of mushrooms are described in detail.

[Food and drug inspection and analysis], R. M. Allen (*Kentucky Sta. Food and Drugs Bien. Rpt., 8 (1913–1915), pp. 1–12, 26–44*).—This is a report of the work done under the state food and drugs act during the biennium ended June 30, 1915, which included the analysis of 11,095 samples of foods and drugs, a bacteriological study in cooperation with the Bureau of Chemistry of the U. S. Department of Agriculture as to the packing, shipment, and sale of oysters, an extensive sanitary survey of the establishments in the State engaged in the slaughtering of cattle and the packing of meat, a study of eggs sold on the market, and, in connection with the research work of the experimental bakery, tests of the effects of a variety of different substances upon the quality of the bread.

From a study made of the effect of wrapping upon the quality of the loaf, the the following conclusions are drawn: The chemical change is slight or none at all for the different substances in the loaf for a limited time so more can be deducted from the physical appearance, taste, odor, etc. The paraffin paper causes bread to retain all its moisture, which becomes equally distributed even into the crust, destroys its stiffness and renders it less desirable for use. From bread wrapped in porous paper, one secures all sanitary benefits without injury to the loaf. Unwrapped bread is insanitary if exposed, and is liable to the growth of mold. Wrapping in porous paper seems to be the most desirable method."

The possibility of using cotton-seed flour in bread making was studied to some extent. "Cotton-seed flour stimulated fermentation. It caused decrease in loaf volume by weakening or diluting the gluten of the wheat flour. When more than 75 gm. of cotton-seed flour is added the gluten is so weakened that sufficient rise for baking can not be secured. The color resembles that of ginger bread when as much as 20 per cent of cotton-seed flour is added. The loaf has a rich, nutty flavor, that is highly pleasing, and it is the opinion of those who have tried it that the flavor is an improvement over the straight wheat flour."

In connection with the work of the food laboratory, attention was given to the extent and means of preventing food spoilage. This was found to be due mainly to imperfect methods of the producer in picking, packing, and grading; inadequate storage and shipment facilities; improper conditions of storage; and a lack of compliance with general sanitary principles.

[Food and drug analysis], R. E. Rose and L. Heimburger (*Fla. Quart. Bul. Dept. Agr., 26 (1915), No. 1, pp. 8–11, 132–145*).—As a part of the report of the state chemist for 1915, data are given regarding the examination of 375 samples of food and drug products, including 304 samples of citrus fruits.

Report of the agricultural-experiment and food-investigation station at Klagenfurt for the year 1914, H. Svoboda (*Ztschr. Landw. Versuchsw. Oesterr., 18 (1915), No. 6, pp. 357–369*).—The results are herein recorded of the investigation of 1,053 miscellaneous foods and beverages.

Undergraduate budgets, Ada L. Comstock (*Smith Alumnæ Quart., 7 (1916), No. 2, pp. 81–86*).—This article reports the results of a study of the budgets of 421 students in Smith College during the school year 1914–15.

Foodstuffs, D. Sommerville (*Jour. Roy. Soc. Arts, 63 (1915), Nos. 3277, pp. 893–903; 3278, pp. 909–921; 3279, pp. 925–932; 3280, pp. 937–943*).—In this series of four lectures the author reviews the principles of food and nutrition in the light of recent investigations.

Nutrition, T. B. Osborne and L. B. Mendel (*Carnegie Inst. Washington Year Book, 14 (1915), pp. 378–384*).—This article summarizes the results of investigations of the vegetable proteins, carried out for the Carnegie Nutrition Laboratory. Most of the material here presented has been noted from other sources.

Nitrogen economy by means of adding ammoniacal salts and urea to the diet, E. Grafe (*Deut. Arch. Klin. Med., 117 (1915), No. 4–5, pp. 448–461; abs. in Zentbl. Physiol., 30 [1915], No. 11, pp. 489, 490*).—A number of instances are reported in which the addition of ammonium chlorid, ammonium citrate, urea, or a combination of these to the diet produced a considerable improvement of the nitrogen balance, which could not be obtained from an ordinary standard diet.

The influence of carbohydrate and fat on protein metabolism with special reference to the output of sulphur, K. Tsuji (*Biochem. Jour., 9 (1915), No. 4, pp. 439–448*).—To determine the effect of diets rich in fat and correspondingly poor in carbohydrate, or vice versa, on protein metabolism as measured by the excretion of sulphur in the urine, feeding experiments were conducted with a laboratory animal (dog). The data of three experiments are summarized in part as follows:

The retention of superimposed nitrogen was greater on a carbohydrate than on a fat diet; in two of the experiments the same was true for sulphur.

"The amount of extra nitrogen and sulphur excreted varies with the protein used. There is no evidence that the protein retained after superimposition is poor in sulphur. Indeed, with the exception of one experiment, sulphur is definitely retained in larger amount than nitrogen."

The influence of fat and carbohydrate on the excretion of endogenous purins in the urine of dog and man, N. UMEDA (*Biochem. Jour., 9 (1915), No 4, pp. 421–438*).—In feeding experiments in which the author served as subject, diets containing varying proportions of protein, fat, and carbohydrate, but purin-free, were consumed in an attempt to get further information concerning the synthesis of uric acid in the human body.

The conclusions drawn are in part as follows: The protein-sparing action of carbohydrate as compared with fat is clearly demonstrated. In the case of man there is some evidence of the synthetic formation of uric acid when the diet is rich in carbohydrate. In fat-rich diets which are carbohydrate-poor the output of uric acid is markedly diminished.

The influence of the diet, especially of carbohydrates, on the secretion of the urine of infants, A. NIEMANN (*Jahrb. Kinderheilk., 82 (1915), No. 1, pp. 21–44; abs. in Zentbl. Physiol., 30 [1915], No. 11, p. 488*).—Instances are described in which normal infants accustomed to a milk diet were given an addition of from 40 to 50 gm. of carbohydrate daily. The amount of urine excreted was considerably increased, and at the same time a gain in weight was noted. The author concludes that the hydrolytic cleavage of di- and polysaccharids produces a storing up of glycogen, which is responsible for these results.

The cultivation of fat-containing organisms. (A present and future problem), LINDNER (*Umschau, 19 (1915) No. 52, pp. 1027–1032, figs. 5*).—Descriptions are given of a number of organisms which have the property of converting the carbohydrate of the culture medium into fat.

Studies on water drinking.—XVIII, On the relation between water ingestion and the ammonia, phosphate, chlorid, and acid excretion, D. W. WILSON and P. B. HAWK (*Jour. Amer. Chem. Soc., 36 (1914), No. 8, pp. 1774–1779*).—In continuation of previous work (E. S. R., 30, p. 766), the authors report experiments with two normal young men who received a simple mixed diet and varying quantities of water at mealtime and between meals.

The excretion of chlorids showed small variations. Increased water ingestion was followed by increased excretion of urinary ammonia, phosphates, and acids. In the author's opinion the data indicate an "increased cell metabolism, causing a formation of acid products which are partly neutralized by ammonia formation and partly cause increased acid phosphates in the urine."

Studies on water drinking.—XIX, Intestinal putrefaction as influenced by the ingestion of softened and distilled waters, C. P. SHERWIN and P. B. HAWK (*Jour. Amer. Chem. Soc., 36 (1914), No. 8, pp. 1779–1785*).—Two series of experiments are reported by which the effect of drinking softened and distilled water on intestinal putrefaction was studied with human subjects. The authors conclude that "both softened and distilled water when taken with meals in volumes ranging from 500 cc. to 1,000 cc. have a tendency to cause a decrease in the putrefactive processes in the intestine as indicated by the urinary indican excretion.

"The nonparallelism of the indican and total ethereal sulphate elimination was again observed."

Acidosis and some of the factors which influence it, R. M. LANG (*Biochem. Jour., 9 (1915), No. 4, pp. 456–478*).—A number of feeding experiments in which the author himself was the subject are reported. Acidosis in starvation and the influence of the nature of the diet, as well as the specific effects of feeding protein, fat, and carbohydrate were the factors studied. The following conclusions are drawn:

"The quantity of acetone bodies excreted by the normal individual, on an ordinary diet containing a sufficiency of carbohydrate, is influenced chiefly by the protein intake. On an ordinary diet from 10 to 30 mg. are excreted daily.

"The administration of quite small amounts of carbohydrate to the starving organism brings about a great reduction in the acidosis. The administration of protein to the fasting organism causes a similar decrease, but this is neither so marked nor so rapid as in the case of carbohydrate. The administration of glycerol under similar conditions also causes a very definite reduction in the acidosis. The administration of fat to the starving organism increases the acidosis. Administration of alcohol is without effect on the degree of acidosis.

"The amount of acetone bodies in the urine during the first few days of starvation depends on the initial carbohydrate storage. These substances appear in abnormal amounts immediately the ratio of the fat to the carbohydrate burnt becomes greater than about 2:1. Immediately the ratio becomes less than this the acetone output is reduced to normal.

"While a relatively large amount of carbohydrate is required to prevent acidosis, quite a small amount suffices to check it very markedly.

"When acetone bodies are excreted in excessive amounts they are for the most part derived from fat. Some evidence is put forward in favor of the possibility of fat being converted into carbohydrate in the body."

Pellagra: Causation and a method of prevention, J. GOLDBERGER (*Jour. Amer. Med. Assoc., 66 (1916), No. 7, pp. 471–476*).—In this article are summarized some of the recent studies of the United States Public Health Service. The bulk of the material has been noted from other sources (E. S. R., 34, pp. 258, 259).

Sanitation and the control of pellagra, C. T. NESBITT (*Jour. Amer. Med. Assoc., 66 (1916), No. 9, pp. 647, 648*).—It is noted, from the experience of the author during the past five years, that pellagra is not decreased by improving sanitation and general disease prevention methods. From a comparison of death rates and a discussion of improved sanitary conditions the author concludes that "there is no existing relation between soil pollution and the incidence of pellagra.

"Close supervision of all cases, disinfection, fumigation, isolation, and the other usual means of controlling infection have no influence on pellagra incidence. Business depression, lack of employment, a limited market for products, and increased price of food, with consequent increase of indigence, increase the incidence of pellagra very definitely."

[Report of the] nutrition laboratory, F. G. BENEDICT (*Carnegie Inst. Washington Year Book, 14 (1915), pp. 295–310*).—This report summarizes the work of the laboratory during 1915. The investigations in progress are reviewed briefly, and changes and additions to the equipment are noted. Brief abstracts are also given of the publications of the laboratory issued during the year.

ANIMAL PRODUCTION.

The numerical results of diverse systems of breeding H. S. JENNINGS (*Genetics, 1 (1916), No. 1, pp. 53–89, figs. 3; abs. in Proc. Nat. Acad. Sci., 2 (1916), No. 1, pp. 45–50*).—The author has found that "when breeding by a given system is continued for many generations several types of results may be distinguished.

"In some cases the proportions of the population having particular constitutions remain the same for all generations. . . . In some complex cases the population changes from generation, and the best we can do is to obtain a formula which shall, when we know the proportions in a given generation n, give us the proportions in the next following generation $n+1$. . . . In many cases the constitution of the population changes from generation to generation

as long as the given system of breeding lasts, and it is possible to give a simple formula in terms of n, the number of generations that the given system has been followed, from which formula the proportions in generation n can be directly computed. . . .

"In most cases the constitution of the population changes from generation to generation, giving a series of values not readily expressed in terms of n (the number of generations) alone. In these cases diverse systems or diverse parents give different series of values, almost all of which are examples of certain simply derived mathematical series or of their combinations. The results are therefore best presented by giving first these fundamental series, each with its designation. Then the results of any number of generations of any system of breeding can be given by designation of the series which it forms.

"A systematic presentation of formulas [is given in the original paper] for the proportions in any generation, resulting from any of the main types of breeding, and with any of the common types of parental population, giving 82 numbered sets of formulas. In each case the limit approached is given, together with the number of generations of breeding required to come within 1 per cent of that limit."

The influence of pituitary feeding upon growth and sexual development.—An experimental study, E. GOETSCH (*Bul. Johns Hopkins Hosp., 27 (1916), No. 300, pp. 29–50, pls. 4*).—The author found that "the dried powdered pituitary extract, derived from both the anterior and posterior lobes of the gland, when fed to young rats in excessive doses (0.1 gm. daily) causes failure to gain in weight, loss of appetite, increased peristalsis, a mild enteritis, and certain nervous manifestations, such as muscular tremors and weakness of the hind limb. . . . Even when whole gland is fed over a short period of time, from 25 to 40 days, it causes a more rapid growth and development and gain in weight, larger nipples in the female, and a coarser, drier, harsher growth of hair than are seen in either control animals or after similar administration of ovarian (corpus luteum) extract in equivalent dosage.

"In comparison with the development in control animals, the ovaries, tubes, and cornua of the uterus of animals fed with whole gland extract are larger, more vascular, and œdematus in appearance, indicating increased development and activity. . . . There is a generally increased vascularity produced in the whole sexual system. The overdevelopment is apparent even in the muscle coat of the uterus, which is considerably thickened, and is also more vascular. . . . The testes show a considerably earlier growth and development; they are completely and permanently descended at an earlier age, and their gross weight is greater than in the control animal. This is evidenced by the extremely active spermatogenesis, with formation of spermatozoa, and by a moderate increase in the amount of interstitial tissue, at a time when the control animal is sexually still very immature. All these developmental, structural, and functional changes in the sex glands of both the male and the female, produced by the feeding of pituitary extract, show an extremely selective and almost specific action of the latter upon the genital system.

"The feeding of pituitary anterior lobe extract causes increased weight and greater and more vigorous body growth and development over the control. There is similarly an earlier and more active genital development. The fur is harsher and thicker. Loss of weight, enteritis, and nervous manifestations are not observed as in the beginning of whole gland feeding. . . .

"After prolonged feeding of anterior lobe extract, over a period of 8 or 9 months, the sexual instincts are early awakened, along with the early maturity of the sex glands. . . . The feeding of pituitary anterior lobe to parent rats

exerts its stimulating influence upon the offspring in intra-uterine life and during lactation, and, when the experiment is carried further, and the feeding to the young is continued after weaning, it has an even greater stimulating effect upon growth, weight, and development, and causes earlier and more frequent breeding, and an increased number of offspring in the litters. The stimulating effect upon the sex glands is greater the longer the influence of anterior lobe administration is exerted.

"The extract of pituitary posterior lobe, even after prolonged administration, does not stimulate growth in general, nor the development of the sex glands, as does anterior lobe even after a very short period. . . .

"Ovarian extract (corpus luteum), when fed to the male, especially, causes a tendency toward the deposition of fat, not only in the body generally, but in the testes and other glands as well, with a resultant marked increase in weight. The fur is heavier and coarser than in the animal fed with the posterior lobe extract. It does not cause an early descent of the testes. . . .

"Following ovarian feeding there is, as compared with conditions in the control, increased development and activity of the female sex glands, increased follicle formation, a moderate increase in interstitial tissue and increased branching of the fimbriated extremity of the tube. Prolonged ovarian feeding, e. g., for 5 to 6 months, to the male rat, as compared with the control, has the following effect: The gross size and weight of the testes, both absolutely and in proportion to the body development, is less, and histologically the sex glands of the male show a retarded development and evidences of diminished activity. The definitely retarding influence of ovarian extract upon the male sexual development is exerted throughout the life of the animal."

Influence of various salts on the reproductive process, R. EMMERICH and O. LOEW (*Arch. Hyg., 84 (1915), No. 6-7, pp. 261-282, fig. 1*).—This reports a study made on the effect of calcium, sodium, and magnesium salts on the number and weight of offspring and on the reproductive process of mice, guinea pigs, and rabbits.

Calcium chlorid increased the number of offspring and was decidedly superior in this respect to either potassium chlorid or magnesium chlorid. Sodium chlorid was also beneficial in increasing the number of offspring. It is thought that these salts stimulate the production of the egg cells in the ovary, thus resulting in larger litters.

The control of sex by food in five species of rotifers, D. D. WHITNEY (*Jour. Expt. Zool., 20 (1916), No. 2, pp. 263-296, figs. 13*).—It is shown that in the American and English rotifer *Hydatina senta* food conditions are the controlling factors in regulating the parthenogenetic production of the two sexes.

Histological study of the "pigment specks" of swine, OLT (*Ztschr. Fleisch u. Milchhyg., 26 (1916), No. 7, pp. 97-100, fig. 1*).—This reports a microscopical study made of the pigment specks found in the epithelial cells of the mammæ of swine.

Acid poisoning due to oat feeding, A. MORGEN and C. BEGER (*Hoppe-Seyler's Ztschr. Physiol. Chem., 94 (1915), No. 5-6, pp. 324-336*).—In studies with rabbits the authors found that the deleterious effect of oats fed alone was not due so much to a lime deficiency as to an acid poisoning which results in a bone disease. The addition of dicalcium phosphate was found to be ineffectual in remedying this condition, as was also sodium chlorid. Sodium carbonate proved to be the most effectual in neutralizing the effect of the acid poisoning and in increasing the live weight of the rabbits.

Bacteriological studies on forage conservation in the silo, C. GORINI (*Ann. Ist. Agr. [Milan], 12 (1913-14), pp. 89-105, fig. 1*).—This is a continuation of

work previously noted (E. S. R., 32, p. 363). It was found possible to control the lactic and butyric acid formations in the silo by the inoculation of certain ferments.

The value of lactic acid bacteria in the ensiling of beet tops, D. MEYER (*Illus. Landw. Ztg., 35 (1915), No. 46, pp. 309–310*).—According to the author, it has been demonstrated that the inoculation of beet-top silage with a culture of lactic acid bacteria improves the quality of the silage and aids in the retention of the digestible nutrients of the feed.

Value of brewery waste products under a new method of preservation, ULRICH (*Ztschr. Öffentl. Chem., 21 (1915), Nos. 6, pp. 85–90; 7 pp. 102–105*).—Analyses are given of brewers' grains, brewery refuse, and brewers' yeast when preserved by a newly patented method.

The preparation of straw meal and the baking of cattle bread, C. BORCHERT (*Illus. Landw. Ztg., 35 (1915), No. 42, pp. 287, 288, figs. 3*).—A method of making cattle bread from straw meal is described.

[Feeding stuff analyses], R. E. ROSE and E. P. GREENE (*Fla. Quart. Bul. Dept. Agr., 26 (1916), No. 1, pp. 94–131*).—Analyses are given of cotton-seed meal, grapevines, corn bran, ground corncobs, ground shucks, ground corn with cob, Mexican clover, ground beggar-weed hay, ground peanut vines, dried beet pulp, shipstuff, molasses feed, meat scrap, alfalfa meal, wheat middlings, wheat bran, shorts, distillers' dried grains, rice bran, and various mixed and proprietary feeds.

Summary prospectus for a proposed building and operation of stockyards and abattoir, to be located near the city of Lexington, R. M. ALLEN (*Kentucky Sta. Food and Drugs Bien. Rpt., 8 (1913–1915), pp. 12–20*).—The general condition of the slaughtering industry in and about Lexington, Ky., is here discussed, with special reference to the proposed construction of stockyards and abattoir.

Report of the Royal Commission on the meat export trade, P. W. STREET (*Rpt. Roy. Com. Meat Export Trade Aust., 1915, pp. 50*).—A report of a very complete investigation made of the meat export trade of Australia, with special mention of the activities of American concerns therein.

A survey and census of the cattle of Bengal, J. R. BLACKWOOD (*Calcutta: Govt., 1915, pp. III+34+XC, pls. 29*).—An account of a government inquiry made in regard to the breeds of cattle of Bengal, their care and management, and methods of improvement.

Africander cattle, K. SOMMERFELD (*Tropenpflanzer, 19 (1916), No. 1, pp. 24–33, figs. 4*).—A general account of the breed characteristics, body measurements, and utility value of the native cattle of German Southwest Africa.

Triplet calves (*Jour. Heredity, 7 (1916), No. 3, pp. 135–137, figs. 2*).—A general discussion of the practicability of breeding a strain of live stock that will produce an unusual number of young. Instances of the inheritance of this quality among cattle and sheep are cited.

[Animal husbandry studies], E. J. IDDINGS (*Idaho Sta. Bul. 84 (1915), pp. 8–12*).—In an experiment with four lots of pigs comparing cooked potatoes, alfalfa hay, and tankage when fed supplementary to a basic grain ration, the most economical gains were made by the lot receiving the alfalfa supplement. Warming the feed did not pay.

In a test in which one lot of sows received a full grain ration, a second lot one-half allowance of grain and alfalfa whole in a rack, a third lot the one-half grain ration and cut alfalfa mixed with the grain, and a fourth lot the same ration as lot 3 except that the mixture was steamed before feeding, the most satisfactory and economical ration was found to be a limited amount of grain supplemented with hay fed in a rack.

In a test in which peas and oats, alfalfa, mixed grasses, and clover were compared as supplements to a grain ration it was found that the peas and oats pasture made a relatively good showing. The mixed pasture was found to be not so valuable.

In the hogging off of peas one lot containing 1.32 acres was used for 25 days by 20 pigs averaging 78.5 lbs., a second lot of 1.42 acres for 38 days by 20 pigs averaging 84.8 lbs., and a third lot of 1.51 acres for 30 days by 15 pigs averaging 54.7 lbs., and for 44 days by 30 pigs averaging 70.8 lbs. Figuring pork at $6.00 per 100 lbs., the peas produced an average return of $25.53 per acre or $2.13 per 100 lbs. of peas in the field. In this experiment the second lot was fed rolled barley as a supplement at the rate of 2 lbs. per 100 lbs. of live weight, but the results did not justify the additional labor.

The following table is compiled from four years' weights of fleeces, two years' records of weights of ewes, weights of lambs at birth, and daily gains of lambs, and a single season record on relative breed maintenance.

Results of tests in sheep breeding and management.

Breed.	Weight of ewes.	Cost of daily maintenance per head.	Birth weight of lambs.	Lambing percentage.	Average daily gain of lambs.	Average weight of fleece.
	Pounds.	*Cents.*	*Pounds.*		*Pound.*	*Pounds.*
Southdown	152.0	1.48	6.8	138.5	0.39	7.7
Shropshire	173.0	1.95	7.1	112.5	.48	12.2
Hampshire	190.0	2.22	9.0	77.5	.60	8.2
Cotswold	184.5	2.22	6.6	125.0	....	17.3
Rambouillet	166.5	1.48	8.4	100.0	.47	14.8

[Live stock experiments] (*New Mexico Sta. Rpt. 1915, pp. 69–79*).—In an experiment with four lots of 8 pigs each, in which lot 1 was given a full concentrate ration, lot 2 a part concentrate ration in the proportion of 1 lb. concentrate to 100 lbs. live weight, lot 3 a concentrate and dried beet pulp ration in the proportion of 1 lb. concentrate and 0.5 lb. beet pulp to each 100 lbs. of live weight, all of the lots receiving as much choice alfalfa hay as they would eat, the results favored the feeding of a full ration. The addition of beet pulp to the ration increased the gains 20 per cent, but this was not enough to pay for the increased cost.

Two lots of pigs were fed an allowance of 2 lbs. of concentrate for each 100 lbs. live weight, lot 1 receiving in addition all the corn silage and lot 2 all the alfalfa hay they would consume. The results of this experiment were in favor of alfalfa hay, both in gains and cost of gains.

In an experiment to determine what use may be made of crops grown under dry-farm conditions for feeding range steers for beef one lot of steers was fed entirely on dry-farm crops, making use of cowpea hay to furnish the protein necessary to balance the ration properly. The other lot was given an allowance of cotton-seed meal in place of the cowpea hay. Both lots were fed silage made of milo maize and Kafir corn, and both had an allowance of ground milo maize and Kafir-corn heads, but the roughage fed to one lot was shredded milo maize fodder and to the other cowpea hay. The results for 76 days show quite markedly in favor of the cowpea-hay fed lot, in both daily gains and cost of gains. The average daily gain per head of the cowpea-hay fed lot was 2.86 lbs., while with the cotton-seed meal lot it was 2.4 lbs.

In continuation of a nutrition project, begun several years ago, calves and yearlings, 2-year-olds and 3-year-olds, were fed for 120 days on alfalfa and milo-maize

meal. Average daily gains for the four ages of 1.55, 1.88, 2.11, and 1.57 lbs. were obtained, consuming 7.81, 10.75, 10.8, and 14.16 lbs. of feed per pound of gain, and dressing 59.92, 59.49, 58.4, and 58.87 per cent for the respective lots. These results agree in general with those of previous work (E. S. R., 32 p. 467) in which alfalfa hay was fed. It was found, however, that the percentages of dressed beef yielded by the different lots of steers in the alfalfa and milo-maize series were, on the whole, appreciably higher than the corresponding figures in the alfalfa-hay series.

Preliminary results of experiments in hog feeding at the college of agriculture, S. B. Durham (*Philippine Agr. and Forester, 4 (1915), No. 8, pp. 173–178*).—Hog feeding experiments conducted at the Philippine College of Agriculture are reported. On a combination of rice bran and pasture the pigs made average daily gains for 85 days of 0.521 lb. per head.

Feeding wheat to fattening swine, L. A. Weaver (*Missouri Sta. Bul. 136 (1915), pp. 3–35, figs. 8*).—In two experiments six lots of 6 and 12 hogs each were fed during two periods of 78 and 42 days, or a total of 120 days, with the following results:

Summary of average results in two swine-fattening experiments.

Lot.	Ration.	First period of 78 days.			Entire period of 120 days.		
		Daily gain per hog.	Grain consumed per pound of gain.	Dressing percentage.	Daily gain per hog.	Grain consumed per pound of gain.	Dressing percentage.
		Pounds.	*Pounds.*		*Pounds.*	*Pounds.*	
1	Wheat	1.25	4.55	80.60	1.25	4.83	85.50
2	Wheat and corn, 1:1	1.18	4.93	82.50	1.18	5.28	86.50
3	Wheat, corn, and tankage, 5:5:1	1.39	4.47	80.50	1.44	4.85	85.00
4	Wheat and tankage, 10:1	1.51	4.24	81.90	1.52	4.69	87.80
5	Corn and tankage, 10:1	1.24	4.62	81.15	1.27	4.98	85.00
6	Corn	1.08	5.12	80.15	1.00	5.82	87.30

Complete data are given on the dressing percentage, weight of blood, liver, entrail fat, heart, tongue, head, shoulder, side, ham, leaf fat, and lard for representative hogs from the several lots.

Results from similar tests at other stations are included.

Determination of the race of swine by the protein differentiation method, A. Lühning (*Landw. Jahrb., 47 (1914), No. 3, pp. 443–475, figs. 6*).—By the protein differentiation method it was found possible to distinguish between the *Sus vittatus*, *S. scrofa*, and various other species of wild and domestic swine.

Feeding experiments with sugar and meat meal for horses, L. Greve (*Berlin. Tierärztl. Wchnschr., 31 (1915), No. 26, pp. 301–303*).—It was demonstrated that as much as 6 kg. of raw sugar and 900 gm. of meat meal, daily, may be fed to horses without harmful results. When fed in moderate amounts as a supplement to an oat and hay ration, work horses did well and increased in weight.

[Poultry husbandry studies], P. Moore (*Idaho Sta. Bul. 84 (1915), pp. 28, 29*).—Three pens of 30 White Leghorn pullets each were fed the following rations for one year: Pen 1, a grain ration of wheat, oats, and barley 15:2:2, and all the grit they would eat; pen 2, a grain ration of wheat, peas, oats, barley, Kafir corn, millet, sunflower seed, and buckwheat 12:2:3:2:1:1.5:0.5:1, and a mash ration of bran, shorts, corn meal, wheat meal, fish meat meal, and charcoal 2:2:1:1:2:1 per cent; and pen 3, a ration the same as that given

pen 2 except that corn was substituted for peas and the oats were fed in the proportion of two parts instead of three.

Pen 1 averaged 24 eggs per pullet; pen 2, 116 eggs; and pen 3, 131 eggs. The percentage of eggs under 2 oz. in pen 1 was 66⅓; in pen 2, 5.5; and in pen 3, 6⅔. Pen 1 cost, exclusive of labor, $19.36, and brought in only $18.45; pen 2 cost $34.91, with an income of $87.15; and pen 3 cost $33.22, with an income of $97.20.

[Comparison of methods of managing poultry], MRS. G. R. SHOUP (*Washington Sta., West. Wash. Sta., Mo. Bul., 3 (1916), No. 11, pp. 9–14*).—This continues work previously noted (E. S. R., 34, p. 669). The pen of pullets, which had been receiving ordinary care, were shut in a house, due to the extreme cold winter weather, and were fed on green feed. This treatment was found to increase the egg production, the egg yield being 30 per cent greater the first 17 days of January than it was the last 17 days of December. It is concluded that housing during the winter, the feeding of green feeds, and regular feeding all go to increase the egg yield.

The lengthening of the work day by artificial light seemed to be followed by increased egg yields, as in the previous work.

Poultry in Texas, J. E. RICE (*Agr. and Mech. Col. Tex. Ext. Serv. Bul. B–10 (1916), pp. 109, figs. 49*).—General information on the breeding, feeding, care, and management of poultry under Texas conditions is given.

What the size of an egg means, D. E. WARNER and W. F. KIRKPATRICK (*Jour. Heredity, 7 (1916), No. 3, pp. 128–131, figs. 2*).—The authors have found, in their work at the Connecticut Storrs Station, that contrary to current belief neither small nor large eggs are necessarily laid either at the beginning or end of a hen's laying period, but that they are most often laid during the time of heavy egg production.

"The number of eggs laid by the 1,820 hens during the 20 months' period was 199,137, of which 103 were small (less than 0.09 lb.) and 89 were large (over 0.179 lb.). . . . The 103 small eggs were laid by only 85 hens, showing that only a small percentage of the hens laid a small egg during their first year of laying. Four hens out of the 85 laid 2 small eggs at different periods of their productivity. . . .

"It was found that only 2 eggs out of a total of 103 indicate a resting period after the production of a small egg. In every other case the small egg was found in an almost uninterrupted series of normal eggs. . . .

"The figures also show that as a rule hens do not lay extremely small eggs at the beginning of their laying periods, but that such eggs are laid at a time when the hen is laying most heavily. It seems clear, therefore, that the small egg is not due to the fact that it is a hen's first attempt, or to the fact that it is the end of her laying period and represents exhausted power. A fairer assumption as to the cause of these small eggs would be that they are due to some mechanical interference with the hen's normal functions—that they are laid whenever a particle of blood, foreign element, or an undeveloped yolk is drawn into the passage where the shells are formed, and that contractions of the oviduct then cause an egg to be laid completely formed, but without having undergone normal development. . . .

"[Of the] 89 large eggs, nearly 99 per cent were laid at the time of heavy production, and in most cases the hen did not rest after laying such an egg, but continued her uninterrupted yield of normal eggs. . . . It further appeared that in most cases the hen did not rest before laying a large egg any more than she did after such a performance. Forty-five of the large eggs were laid without any previous resting period, 31 were laid with a resting period of 1 day before, and 10 were laid with a resting period of 2 days."

DAIRY FARMING—DAIRYING.

Cost of producing milk on 174 farms in Delaware County, New York, A. L. THOMPSON (*New York Cornell Sta. Bul. 364 (1915), pp. 109–179, figs. 19*).—The purpose of this investigation was to find out as nearly as possible what it costs the average farmer to produce milk in the hill regions of New York. All the data for the investigation were collected by the survey method, complete records for two years from 174 typical farms in Delaware County, N. Y., being included. The averages for the two years are summarized in the following table:

Summary of dairy farm survey.

Kind of data.	1912	1913
Number of cows per herd	30.5	28.9
Value of cows per head	$40.00	$47.00
Pounds of milk produced per cow	4,644	4,695
Pounds of milk sold per cow	4,575	4,600
Pounds of milk fat produced per cow	214	217
Pounds of grain per cow and accompanying stock	2,004	2,256
Value of grain per cow and accompanying stock	$31.33	$32.25
Pounds of hay and forage per cow and accompanying stock	4,504	4,430
Value of hay and forage per cow and accompanying stock	$40.36	$34.11
Pounds of silage per cow and accompanying stock	1,793	1,656
Number of feed units, excluding pasture, per cow and accompanying stock	4,187	4,321
Acres of pasture per cow and accompanying stock	3	3
Annual cost of pasture per cow and accompanying stock	$4.29	$3.82
Cost of bedding per cow and accompanying stock	$0.91	$0.79
Value of buildings per cow and accompanying stock	$68.00	$67.00
Annual cost of buildings per cow and accompanying stock	$5.31	$5.66
Hours of human labor per cow and accompanying stock	158	129
Cost of labor per cow and accompanying stock	$22.45	$18.11
Miscellaneous costs per cow and accompanying stock	$1.19	$1.22
Cattle cost per cow and accompanying stock	$1.00	(a)
Cost of dairy equipment per cow	$0.49	$0.45
Cost of hauling milk per cow	$5.90	$6.10
Total cost per cow	$118.84	$107.67
Total returns, other than milk sold, per cow	$11.21	$14.21
Loss per cow	$32.14	$12.50
Amount received per pound of milk, cents	1.65	1.76
Cost per pound of milk, cents	2.35	2.03
Cost per quart of milk, cents	5.10	4.40
Cost per pound of milk fat, cents	51	44
Miles from station	2.7	2.7
Per cent of butter fat in milk	4.6	4.6

[a] There was enough stock raised to show an appreciation in 1913.

In 1912, 15 dairy herds, or about 1 in 11, showed a profit. The average cow paid all costs excepting the value of hay and forage raised on the farm, for which only 28 per cent of its farm value was obtained. In 1913 dairy conditions were more favorable, as grain and forage were cheaper, and milk brought a better price, and 52 herds, or 30 per cent, showed some profit. The average cow paid all costs except hay and forage raised on the farm, and paid 66 per cent of the farm value for this.

In 1913 the cost of hauling milk per cow was $4 in the herds with more than 55 cows, and $8 in the herds with 20 or less cows. The annual cost for sheltering a cow was $7 in the herds with 20 cows or less, and $4 in the herds with over 40 cows. The average investment in buildings per cow for the herds with 20 or less cows was $76. In the herds with 41 or more cows it was $54. The value of the feed used per cow did not vary greatly in proportion to the size of herd. The milk production was higher in the medium-sized herds than in the large or small herds. The size of herd did not greatly affect the cost of milk production, this being 2.42 cts. per pound in the herds with 20 or less cows, and 2.37 cts. in the herds with over 40 cows.

In 1912 the value of pasture land on farms 1 mile or less from the milk station averaged $25 per acre; on farms over 1 mile and not more than 3 miles from market, $20 per acre; on farms from 3 to not more than 4 miles from market, $18 per acre; and on farms over 4 miles from market, $16 per acre. The cost of hauling milk on farms 1 mile or less from market was $4 per cow, or 8.7 cts. per 100 lbs. of milk sold. When the distance hauled was more than 4 miles the cost of marketing was $7 per cow, or 15.3 cts. per 100 lbs. of milk sold. The production of milk, the cost of feed, and the cost of production did not differ greatly with the distance from market.

Cows that were given $41 worth of feed in addition to pasture produced milk for 1.47 cts. per pound and made an average profit of $13. This profit was made on a production of 4,100 lbs., which is 363 lbs. below the average for the State. When the value of the grain, hay, and silage was increased by $28 the milk production was increased by 791 lbs. and the profits were decreased by $22. After this point each additional increase of barn feed resulted in increased production, but the milk cost more and the loss per cow was increased. One-half of the dairymen who used $55 or less of winter feed per cow produced milk for 2 cts. per pound or less, but those who gave more winter feed lessened their chances of producing milk cheaply. The cows that received on an average only 2,677 feed units produced 3,925 lbs. of milk which cost 1.80 cts. per pound. Cows that received an increase of 917 feed units produced an increase of 229 lbs. of milk. Increases in feed in the next two groups resulted in increased production but the cost per pound of milk remained much the same. When the cows were fed more than 5,421 feed units the production continued to increase, but the increased value of the feed necessary to make this change was out of proportion to the value of the milk.

Silos were found in the larger dairies, and more intensive methods of feeding are being followed on the farms that have silos. The value of the feed used per cow and accompanying stock on the farms with silos was $86 in 1912 and $80 in 1913, and on farms without silos $79 and $71. The average production of milk per cow in the herds where silage was fed was 4,791 lbs. in 1912 and 4,778 lbs. in 1913, and in the herds not fed silage 4,516 lbs. in 1912 and 4,624 lbs. in 1913. The cost of production per pound of milk where silage was used was 2.32 cts. in 1912 and 2.08 cts. in 1913, and where silage was not used 2.38 cts. and 1.99 cts.

A larger expenditure for feed and more feed units were used in the herds of higher value. The amount of labor spent per cow in the different groups was fairly constant. The production per cow was higher in the herds of high value. Intensive feeding of the average cow did not pay, but the group containing cows valued at $55 or more was able to use as much as $94 worth of feed and show a profit.

The milk from the Holstein group tested the lowest in fat, averaging 4.1 per cent in 1912 and 4.2 per cent in 1913. The Jersey group tested the highest, with an average test of 4.8 per cent in 1912 and 4.7 per cent in 1913. Not counting pasture the Holsteins consumed more feed than did the other groups but were closely followed by the Jerseys. The Jerseys used more expensive feed, so that their ration cost a little more than the Holstein ration. In 1913 the average profit per cow among the 542 Holstein cows was $3, while the 3,026 Jersey cows showed an average loss of $15, and the cows of mixed breed a loss of $19 per cow. The Holstein herds, however, were mainly on the valley farms, where natural conditions for economical milk production were better, and this may help to account for the better showing made by the Holstein group.

The highest production was found in the herds for which the milk fat test of the milk was low. In 1913 the production per cow in the herds for which the test of the milk ran 4.4 per cent of milk fat or below was 4,998 lbs., while in the herds for which the milk tested from 4.5 to 4.6 per cent it was 4,738 lbs., for those with milk testing from 4.7 to 4.8 per cent, 4,431 lbs., and for those with milk testing over 4.9 per cent, 4,584 lbs. The cost of producing milk was less and the profit per cow was greater in the herds for which the test of the milk was low. Milk testing 4.4 per cent of milk fat, or less, cost 1.9 cts. per pound to produce, and milk testing 4.9 per cent of milk fat, or more, 2.19 cts.

The cost of producing 1 lb. of milk was 0.28 ct. less in the herds for which milk records were kept. The keeping of records apparently decreased the loss by $11 per cow in 1912, and in 1913 changed a $14 loss to a $3 gain.

In every instance the value per cow increased when the production increased, but an increase of 1,000 lbs. of milk made only a small increase in the value per cow. This means that more milk can be produced from $1,000 invested in good cows than can be produced from a similar amount invested in poorer cows.

The cost of producing 100 lbs. of milk was greater in the low-producing herds. In order to produce milk at a profit in 1912 it required an average production of 7,219 lbs. per cow.

Data on the cost of producing milk in other States are included.

Dairy husbandry (*Washington Sta. Bul. 127* (*1915*), *pp. 9–11*).—Cows fed beet pulp, moistened with 5 parts by weight of water, consumed the feed with considerable relish and rapidly increased in milk yield during a two-week period. Although it was difficult to accustom the cows to eating the feed at first, later they would eat from 6 to 8 lbs. more of the soaked pulp than they would of the corn silage. The general condition of the cows fed the beet pulp was comparable with that of those fed corn silage, and there was no appreciable difference in their weights. Since their feeding value is about the same, it appears that the extended use of beet pulp as a substitute for silage depends largely on the relative cost of producing and preserving silage and the cost of dried beet pulp.

Three lots of 6 calves each were fed 90 days, the grain ration consisting of ground oats, wheat, and barley, with bran, together with clover or alfalfa hay, lot 1 receiving in addition skim milk, lot 2 Blatchford's calf meal, and lot 3 a homemade calf meal. Skim milk gave the best results as a substitute for whole milk, yet the other feeds, with a limited use of skim milk, gave fair results. The skim-milk lot made the largest gains per day with the lowest cost per pound. Grain mixtures fed dry rather than mixed with milk gave the best results.

A number of cows were divided without regard to breed into groups of large and small cows, cows weighing 1,100 lbs. or more being taken as large. During a five-month period it was found that with the cost of feed alone considered the small cows produced milk fat for 1 ct. per pound less than the large cows, but did not produce milk as cheaply. When the total expenses were considered, the large cows produced milk fat at 3 cts. less per pound, and milk at 57 cts. less per 100 lbs. than the small cows.

[Feeding experiments with dairy cattle], R. Carr (*Michigan Sta. Rpt. 1915*, *pp. 234, 235*).—Two lots of four cows each were fed five months in periods of two weeks by the reversal method, one week intervening between periods, one group receiving 30 lbs. per day of silage as a succulent feed, the other group 30 lbs. of roots. The cows were allowed all the alfalfa hay they would eat and a grain ration which was not changed throughout the test, each animal being given approximately 1 lb. of grain to 4 lbs. of milk. Other conditions were maintained as identical as possible.

There seemed to be no appreciable difference between the silage and root rations as to the amount of hay eaten. Each group and each individual cow produced more milk from the root ration, but the difference was not very great, averaging 0.7 lb. per day per cow. While the number of cows was small and the test covered but one season, it is believed that the figures would seem to warrant the conclusion that the roots are at least as good as the corn silage. Data on the cost of growing and handling these crops seem to indicate very little difference in that respect, local conditions influencing the cost greatly.

Experiments in feeding dairy cows (*New Mexico Sta. Rpt. 1915, pp. 66–69*).—In an experiment with two lots of dairy cows, fed for 30-day periods, in which one lot received a ration consisting of 30 lbs. of corn silage, 1 lb. of concentrate to each 5 lbs. of milk, and all the choice alfalfa hay they would eat, and the other lot the same feed with the exception of the corn silage, for which 8 lbs. of dried beet pulp was substituted, a 10.6 per cent larger yield of milk and milk fat was obtained from the lots fed dried beet pulp. However, the milk cost 28 per cent more and the fat 33⅓ per cent more.

Dairy herd records, their value, and how to keep them, A. B. Nystrom and R. E. Hundertmark (*Washington Sta. Popular Bul. 97 (1915), pp. 3–16, figs. 6*).—General information on how to keep records, and the value of such records in increasing dairy profits, is given.

Report of the department of dairy husbandry, O. F. Hunziker (*Indiana Sta. Rpt. 1915, pp. 34–45*).—In continuation of work previously noted (E. S. R., 32, p. 672) a calf-feeding experiment was carried on in which one lot received whole milk, skim milk, ground corn and oats as a dry mash, alfalfa hay, and corn silage, and another lot a home-mixed calf meal containing hominy feed, linseed meal, red dog flour, and dried blood, equal parts by weight, in place of the skim milk. The following conclusions are drawn:

"The use of skim milk as a feed for young calves is increasing in those sections where it is available in large quantities. Its use for this purpose should be encouraged unless its market value is very much above 30 cts. per 100 lbs. So long as skim milk is available as a feed for live stock, milk substitutes for dairy calves are of very limited value.

"In certain sections of the State the chief product sold from the farm is whole milk. Under these conditions the growing of dairy heifers becomes a very expensive proposition unless a milk substitute may be secured, making it possible to reduce the amount of milk required for calf feeding to the minimum. Under such conditions the use of a home-mixed calf meal is advisable, although the calf so produced will not be as well developed at six months of age as if fed milk during its early growing period.

"The prices charged by concerns manufacturing calf meals are usually very much above the actual cost of producing them, chiefly on account of advertising costs, transportation charges, and dealers' profits. All things being equal, so far as the efficiency of the ration is concerned the use of a ready-prepared calf meal is largely prohibitive on account of the high retail prices of such feeds.

"The results, from the standpoint of gain in weight and growth in height, produced by feeding Blatchford's calf meal do not warrant its recommendation as an absolute milk substitute for the growing of dairy calves.

"In order for a ration to be considered an unqualified success for dairy calves, it should produce at least 1 lb. of gain per day as an average for the first six months of the life of the calf. An average daily gain of 1.5 lbs. is not uncommon, although slightly above that which the average dairyman may expect.

"The amount of grain mixture and dry roughage consumed by dairy calves is a splendid index to their thriftiness. The development of an appetite for dry feeds by dairy calves is governed by the type of milk or milk substitute ration

fed and the method of feeding the supplementary feeds. The feeder's ability to encourage and teach the calves to eat dry feeds is an important factor to consider in raising calves by hand.

"The amount of food nutrients required per day by growing calves is, approximately, $\frac{1}{3}$ lb. of protein, 1 lb. of carbohydrates, and 1.05 lb. of fat. The above figures are based upon the total amount rather than the amount of digestible nutrients consumed.

"The rate of growth in height of dairy calves is rather uniform during the first six months of their life. The average monthly growth for an average-sized calf should be from 1.5 in. to 2 in., although certain individuals will very much exceed these figures.

"As dairy calves advance in age their relation between height and weight gradually changes. A calf at 30 days of age should weigh, approximately, 3 lbs. for each inch in height. This figure gradually increases until, at six months of age, the average calf should weigh, approximately, 6.5 lbs. for each inch in height."

Work thus far completed indicates that cotton-seed meal has very little effect on the breeding properties of dairy heifers.

In continuation of the report previously noted (E. S. R., 30, p. 575) on the pasteurization of cream for butter making, it appears that "the germ-killing efficiency of pasteurization varies with the bacterial flora of the cream, and the latter in turn varies with the season of the year.

"Extremely high pasteurizing temperatures, such as 185° F. and higher, while efficient in destroying germs, may cause a very poor quality of butter when used on very sour cream. The resulting butter tends to have a disagreeable oily flavor, suggesting also fishiness. This is particularly true in early summer when the cows are on green pasture and the butter fat contains a relatively high percentage of olein, which appears to yield to the oxidizing action of the combination of high acid and high heat. Under these conditions the lower pasteurizing temperatures, such as 160 to 165° flash, and 145° holding, give decidedly better results.

"Vat pasteurization, while producing a good flavor, appears to give the butter a more or less mealy texture. This is probably due to the prolonged exposure to heat due to slow cooling.

"Butter made from cream properly pasteurized shows a decided improvement over butter made from raw cream of the same quality."

Directions for the manufacture of commercial buttermilk from skim milk or whole milk, based on the station work, are presented. In order to produce a buttermilk of good quality and possessing the proper balance of flavor, acidity, body, and holding-together property it seems necessary to use two separate and distinct species of lactic acid bacteria, viz, *Bacillus bulgaricus* and *Streptococcus lacticus*. Where a whole milk buttermilk is desired (buttermilk containing milk fat) a much better flavor is produced when the whole milk is first separated, only the skim milk soured, and the cream mixed back into the product after the fermentation is completed. In this way the prolonged exposure of the fat to the high acid, which gives the finished product a rather coarse flavor, bordering on rancidity, is avoided and the buttermilk has a rich, smooth, and creamy flavor.

Milk inspections, R. M. Allen (*Kentucky Sta. Food and Drugs Bien. Rpt., 8 (1913–1915), pp. 21–25*).—It is stated that very practical and effective methods of milk inspection have been worked out in Kentucky, and that these methods are showing a widespread improvement in both the chemical and bacteriological purity of the State's milk supply. Bacteriological examinations directed toward both market samples and the processes in the dairy and milk depots

have been the chief means for accurate knowledge of sanitary condition and the omissions in practice responsible for contaminated milk.

Marked results were noted as the result of the elimination of dust from the barn. It is stated that dust in the barn and the failure to sterilize utensils are two of the chief reasons for high bacterial counts. These conclusions are rather in contrast to those reached by the New York State Station (E. S. R., 34, p. 183).

Hygienic milk, J. PRITZKER (*Schweiz. Apoth. Ztg., 53 (1915), Nos. 42, pp. 583–586; 43, pp. 593–597; 44, pp. 609–612; 45, pp. 624–628*).—A summary and digest of data, including the findings of bacteriological examinations of milk prepared under various conditions of cleanliness. It is maintained that raw milk obtained and handled with proper precautions is the best substitute for mother's milk. Pasteurization and sterilization reduce the number of bacteria, but boiling alters the chemical composition of the milk. Sterilized milk is considered responsible for rachitis and scurvy in infants.

Slimy and ropy milk, R. E. BUCHANAN and B. W. HAMMER (*Iowa Sta. Research Bul. 22 (1915), pp. 207–295, figs. 10*).—A study of slimy and ropy milk sent in for examination to the dairy bacteriological laboratories has shown the following:

"Cultures of organisms secured from slimy starters, apparently typical *Streptococcus lacticus* forms, sometimes showed marked capacity to produce ropiness when inoculated into sterile milk. This slime-producing power is evidently a variable characteristic, appearing and disappearing without apparent cause. Associative action of organisms in some cases is responsible for ropiness. Two organisms, neither of which alone can cause ropiness, may, when grown together, cause the medium to become slimy. *Bacterium (lactis) viscosum* is one common cause of slimy milk. Certain peptonizing bacteria, as *B. peptogenes*, produce a very slimy residuum after digestion of the casein. *B. bulgaricum* and certain related high acid organisms frequently produce marked viscosity in milk.

"Sliminess in milk is apparently due to different causes with different organisms: Gum and gumlike capsular materials partially soluble, or at least swelling in water, are frequently the same. In many cases there seems to be a direct relationship between chain formation of streptococcus and the development of ropiness, likewise between the numbers of bacteria and ropiness. Associative action between two distinct organisms resulting in great increases in number of each is not uncommon as a cause of ropiness. Methods of control and prevention of slimy milk are discussed."

Keys to the organisms that have been described as responsible for slimy production in milk are presented. An attempt has been made to clear up synonymy. Descriptions of 33 species of bacteria that have been found associated with milk are given, and the literature reviewed. A bibliography is appended.

Effect of salt on butter flora, W. GILTNER and J. D. BAKER (*Michigan Sta. Rpt. 1915, p. 209*).—It has been found that salt to a concentration of 12 per cent does not in all cases retard growth, and that the growth of some organisms is not prohibited by 20 per cent of salt. Streptococci are sensitive to salt, while micrococci and staphylococci can tolerate a high percentage. Most of the yeasts and torulæ of butter are not easily affected by salt, yet they can not withstand as much salt as some of the cocci. Salt (8 per cent) retards the physiological processes of most organisms. Micro-organisms which liquefy casein and gelatin are more easily affected by salt than nonliquefiers. Some organisms by continued cultivation on salt agar increase their maximum tolerance for salt.

Butter making on the farm, A. B. Nystrom and R. E. Hundertmark (*Washington Sta. Popular Bul. 96 (1915), pp. 23, figs. 10*).—This bulletin deals with the importance of sanitation in butter making, ripening cream, steps in the manufacture of butter, kinds of churns, preparing butter for market, and marketing farm butter.

VETERINARY MEDICINE.

Table of veterinary posology and therapeutics for students and practitioners, G. A. Banham and W. J. Young (*London: Baillière, Tindall & Cox, 1915, 4. ed., pp. XVI+272; rev. in Vet. Jour., 71 (1915), No. 483, pp. 453, 454*).—The fourth edition of this handbook.

Principles of general physiology, W. M. Bayliss (*London and New York: Longmans, Green & Co., 1915, pp. XX+850, figs. 259*).—This new volume on general physiology treats of those subjects which are common to all living organisms. A brief summary of the material considered is appended to each chapter.

A very complete bibliography covering 80 pages is included.

Report of the live stock sanitary commissioner of the State of Maine on contagious diseases of animals, 1914, A. Joly (*Rpt. Live Stock Sanit. Comr. Me., 1914, pp. 139, pls. 14*).—A report of the occurrence of, and work of the year with, diseases of animals.

Report of the bacteriologist, W. Giltner (*Michigan Sta. Rpt. 1915 pp. 194–204*).—These pages contain partial results of a study by L. R. Himmelberger of the immune bodies of antihog-cholera serum and methods for diagnosing hog cholera, and a review of the outbreak of the foot-and-mouth disease in 1914, by E. T. Hallman.

Biennial report of the state live stock inspector of the State of Tennessee, 1913–14, G. R. White (*Bien. Rpt. State Live Stock Insp. Tenn., 1913–14, pp. 22, figs. 2*).—This account of work for the period under report deals particularly with that of hog-cholera control.

Report on the veterinary division, A. S. Milne (*Rpt. Dept. Sci. and Agr. Brit. Guiana, 1913–14, App. 4, pp. 5*).—A brief statement of the work of the year.

Annual reports on the civil veterinary department, United Provinces, for the years ending March 31, 1914 and 1915, E. W. Oliver (*Ann. Rpts. Civ. Vet. Dept. United Prov., 1914, pp. 4+II+25; 1915, pp. 4+II+25*).—These annual reports include accounts of the occurrence of diseases of animals, breeding operations, etc.

Biological investigations of the amins derived from proteins in organ extracts and body fluids, M. Guggenheim and W. Löffler (*Biochem. Ztschr., 72 (1916), No. 5–6, pp. 303–324, figs. 36*).—The authors have studied the effect of certain amins on the isolated guinea pig intestine suspended in Ringer's solution. These amins are derived in the animal organism from the amino acids by the cleavage of carbon dioxid, probably through the agency of bacteria, as demonstrated by earlier investigators.

Very small amounts of β-imidazolethylamin, oxyphenylethylamin, phenylethylamin hydrochlorid, isoamylamin hydrochlorid, indolethylamin hydrochlorid, suprarenin hydrochlorid, etc., were found to exercise a marked tonic effect. Alkali salts of the higher fatty acids, gallic acid, oxalates, citrates, indol, phenol, cresol, guaiacol, and disodium phosphate were found to have a similar action, much larger doses, however, being necessary. In amounts less than 0.1 gm. per 100 cc. of Ringer's solution alipathic amino acids, silk peptone, solutions of egg white, dioxyphenylalanin, histidin, tryptophan, paraoxyphenylacetic acid, homogentisic acid, cadaverin, putrescin, etc., were found to exercise no reaction.

The relation of such action as a probable etiological factor of intestinal autointoxication and other pathological conditions is indicated.

The fate of amins derived from proteins in the animal organism, M. Guggenheim and W. Löffler (*Biochem. Ztschr., 72 (1916), No. 5-6, pp. 325-350, figs. 7*).—It has been demonstrated that isoamylamin, phenylethylamin, paraoxyphenylethylamin, indolethylamin, and β-imidazolethylamin are detoxicated in the animal organism. This detoxication results from a deamination and subsequent oxidation, the end product being an acid with the same number of carbon atoms as the original amin. As intermediate products in the oxidation of the amins, alcohols were isolated and identified by perfusing the isolated liver with the respective amins. The fact was thus established that the liver is able to oxidize certain alcohols to their corresponding acids.

Normal human blood and serum, and also that of the rabbit, exhibited a tonic effect on the isolated guinea-pig intestine. The active principle causing this effect was found to be soluble in alcohol and thermostable.

Studies in anaphylaxis, XIV-XVII, R. Weil (*Jour. Immunol., 1 (1916), No. 1, pp. 1-49*).—Four studies are here reported, continuing previous work (E. S. R., 33, p. 82).

XIV. *On the relation between precipitin and sensitizin* (pp. 1-18).—From experimental data it has been demonstrated that passive sensitization toward horse serum can be induced in guinea pigs by injecting intraperitoneally precipitates produced by horse serum and the serum of a rabbit immunized against horse serum. The same results can be obtained by using crystalline egg albumin. Certain quantitative relations have been found to exist between antigen and antibody in producing the precipitates which do not vary outside of certain fairly wide limits. A great excess or deficiency of either factor produces a precipitate which fails to sensitize passively.

"The precipitating substance of immune sera is competent to sensitize guinea pigs passively. In other words, precipitin is also sensitizin [the substance which confers sensitization]. It is conceivable, but improbable, that there may be a fraction of precipitin which lacks the sensitizing function.

"Antibody may be deprived of its precipitating function by heat without suffering a very material diminution in its sensitizing value. This observation corresponds with the previously known fact that 'precipitoid,' or heated precipitin, has retained its combining power with antigen, although it has lost its precipitating power. The precipitating, or ergophore group, is said to be thermolabile; the sensitizing or haptophore group, to be thermostable.

"Only the combining (or haptophore) group is essential to passive sensitization. Anaphylaxis therefore consists simply in the cellular reaction due to the fixation of antigen by cellular antibody. These new data therefore confirm and establish the theory of anaphylaxis supported in previous studies of this series.

"The fact that the coexistence of antigen in the same fluid may inhibit the precipitating power of antibody while only partially interfering with the sensitizing function, as in the prozone experiments, may explain the divergence in the literature between those who maintain that precipitin and sensitizin run parallel in immune sera and those who deny this relationship.

"The phenomenon which has been described as dissociation of the precipitate, which probably occurs within the body and which may be imitated by various laboratory procedures such as extraction by sodium carbonate, sets free antibody in a form which sensitizes passively but fails to give the precipitin reaction. Such a factor, likewise, would upset the normal parallelism between sensitizin and precipitin.

"The foregoing consideration may serve to explain the fact that the presence of antibodies may be demonstrated by means of passive sensitization in spite of

the fact that the test tube reactions, such as agglutination and precipitation, prove ineffective. In infectious disease the coexistence of the antigen (the infectious agent or its product) in the blood might be expected to produce this result."

XV. *Equilibrium in precipitation reactions. Equilibrium in combination* (pp. 19–34).—The supernatant fluid resulting from the preparation of precipitates with rabbit serum, previously immunized against horse serum, and normal horse serum was found to contain both antigen and antibody. Similar results were obtained with raw egg albumin. Purified egg albumin, however, exhibited entirely different results. When treated as above the supernatant fluid never contained both antigen and antibody simultaneously. Raw egg albumin was found to contain more than one antigen, and the antiserum, therefore, correspondingly contained more than one antibody. The protective action of a third colloid, preventing complete interaction of antigen and antibody, has not been demonstrated. Cross precipitations could not be induced by mixing the sera of different rabbits immunized against crystalline egg albumin, but were possible when raw egg albumin was used as antigen.

From the experimental results it is concluded that precipitin and precipitinogen can not exist in the same fluid without undergoing union and producing precipitation. The instances of the apparent coexistence of antigen and antibody reported in the literature must be explained on the basis of multiplicity of antigens.

XVI. *Equilibrium in precipitation reactions. Dissociation* (pp. 35–46).—Experimental data show that "precipitates contain both antigen and antibody, as shown by the fact that they sensitize both actively and passively. If precipitates are treated with salt solution in the incubator, the extracts are found to contain a small amount of antigen, but no antibody. If precipitates are extracted with solutions of sodium carbonate, antigen is readily demonstrable in the extracts. Precipitin can not be demonstrated, but antibody is demonstrable in large amounts, by the method of passive sensitization (sensitizin). Extraction with trypsin and with leucocytes yields both precipitin and precipitinogen."

XVII. *On the coexistence of antigen and antibody in the body* (pp. 47–49).—The author concludes that antigen and antibody may coexist in the same fluids in the test tube in reactive form, and also in the blood and in the cells of the living animal. Antibody, even if in combination with antigen, is still capable of reacting with fresh antigen.

Studies in nonspecific complement fixation, I–V (*Jour. Infect. Diseases, 18 (1916), No 1, pp. 20–87*).—The studies here reported consist of a number of papers as follows: (1) Nonspecific Complement Fixation by Normal Rabbit Serum, by J. A. Kolmer and Mary E. Trist (pp. 20–26); (2) Nonspecific Complement Fixation by Normal Dog Serum, by J. A. Kolmer, Mary E. Trist, and G. D. Heist (pp. 27–31); (3) The Influence of Splenectomy and Anesthetics on the Nonspecific Complement Fixation Sometimes Shown by Normal Rabbit and Dog Sera, by J. A. Kolmer and R. M. Pearce (pp. 32–45); (4) The Relation of Serum Lipoids and Proteins to Nonspecific Complement Fixation with Normal Rabbit and Dog Sera, by J. A. Kolmer (pp. 46–63); and (5) The Effect of Heat on Normal Rabbit and Dog Sera in Relation to Antilytic and Nonspecific Complement-Fixation Reactions, by J. A. Kolmer and Mary E. Trist (pp. 64–87).

It is indicated that the sera of rabbits which are intended for use in complement-fixation tests should be tested several times before the animals are inoculated, preferably with the particular antigen to be used, and only those selected that react negatively. It is further emphasized that great caution

should be employed in the interpretation of complement-fixation tests with dog serum.

It is concluded that the nonspecific complement fixation by normal rabbit and dog sera is probably due primarily to thermolabile and thermostabile antilytic (anticomplementary) substances in the sera.

The dialysis method for the determination of pregnancy in animals, with special reference to the sources of error, M. KAHN (*Arch. Wiss. u. Prakt. Tierheilk., 41 (1915), No. 3, pp. 222–243*).—The importance and value of an early diagnosis of pregnancy and the difficulty of determining such a condition by a purely physical examination is pointed out. The theory of the origin and mechanism of the defensive ferments produced by the parenteral introduction of foreign protein into the animal organism is also discussed, and the technique of the method, including the preliminary testing of the dialyzation tubes, preparation of the placental tissue, etc., is described in detail.

From experimental data it is concluded that the dialysis reaction can be used for the diagnosis of pregnancy in horses and cattle from the first month to full term, using the technique as described. Only such results as are obtained with hemoglobin-free perfectly clear serum, properly prepared placental substrate, and standardized tubes can be considered as trustworthy.

The serum of nonpregnant mares and of geldings persistently showed a negative reaction. The same results were obtained with cattle.

Special attention is called to the fact that the prepared placental tissue of the horse could not, in some instances, be used after 24 hours unless again freed from ninhydrin reacting substances by boiling in distilled water. The importance of using dialyzation tubes which are impermeable to protein yet permeable to peptones, and which have been carefully standardized, is also emphasized.

Oleander poisoning (*Ztschr. Veterinärk., 27 (1915), No. 12, pp. 366, 367*).—Two cases of poisoning in horses, resulting in death and attributed to the eating of oleander leaves, are reported.

The animals first refused food and soon became unable to stand. On examination the pulse was found to be weak, the heart sounds indistinct, the conjunctiva congested, respiration labored, peristalsis suppressed, and fever absent. On post-mortem no visible pathological changes except a small clot in the heart cavity of one of the animals were evident. The stomach and intestinal contents revealed the presence of fresh green leaves, later identified as oleander leaves.

See also a previous note by Wilson (E. S. R., 21, p. 681).

The use of medicaments in the treatment of diseases caused by nematodes, A. RAILLIET (*Rec. Méd. Vét., 91 (1915), No. 15, pp. 490–513*).—A summarized account. See also a previous note (E. S. R., 34, p. 576).

Comparative tests of the action of certain common disinfectants, A. KRUPSKI (*Schweiz. Arch. Tierheilk., 57 (1915), No. 12, pp. 615–651, figs. 5*).—Experimental data obtained from comparative tests of a number of disinfectants are submitted. The results are in part represented graphically.

It is indicated that in general the cresol emulsions best fulfill the chief requirements, viz, cheapness and bactericidal strength, of an efficient disinfectant.

The disinfection of infected wood, E. FLEISCHER (*Wiener Tierärztl. Monatsschr., 2 (1915), No. 11, pp. 497–507*).—As the result of an investigation to determine the value of various agents for the disinfection of wood the author has demonstrated that stronger solutions of the disinfectants are necessary in actual practice than were found to be satisfactory in the experi-

mental tests. The materials used were lime, bleaching powder, potassium hydroxid, antiformin, formaldehyde, and mercuric chlorid. All were found to be satisfactory in proper concentrations. The organisms used were the anthrax, swine plague, and chicken cholera bacilli.

It is concluded that under the experimental conditions a 2.5 per cent solution of formaldehyde is the most reliable disinfectant, even in the presence of anthrax spores.

A bibliography of some 30 references is appended.

A contribution to the evaluation of methods for the bacteriological and serological diagnosis of anthrax with special reference to the microscopical investigation, W. Pfeiler and G. Scheyer (*Berlin. Tierärztl. Wchnschr., 32 (1916), No. 3, pp. 25–30*).—The authors discuss the various methods used in staining the anthrax bacillus, and indicate those stains which have been found to give the most satisfactory results. The results of 315 examintaions of pathological specimens, comprising 113 cases in cattle, 8 in the horse, 4 in sheep, and 190 in swine, are reported in tabular form and briefly discussed. The precipitin reaction, microscopical examination and culture and animal inoculation were the methods used in diagnosing the cases reported.

A bacteriological study of methods for the disinfection of hides infected with anthrax spores, F. W. Tilley (*Jour. Amer. Leather Chem. Assoc., 11 (1916), No. 3, pp. 131–160*).—This is a slightly abridged account of the investigation previously noted (E. S. R., 33, p. 178).

The biology of pseudoanthrax bacilli.—Contribution to the differential diagnosis of anthrax and pseudoanthrax bacilli, N. Pokschischewsky (*Arb. K. Gsndhtsamt., 47 (1914), No. 4, pp. 541–590, pls. 4*).—This paper, substantially noted from another source (E. S. R., 33, p. 579), includes a three-page bibliography.

Foot-and-mouth disease, L. Nevermann (*Arch. Wiss. u. Prakt. Tierheilk., 41 (1915), No. 3, pp. 177–210, pls. 2*).—The serious outbreaks in Germany and the means used in handling such epizootics are reviewed. Methods of control are considered under three divisions (1) the slaughter of infected animals, (2) quarantine measures, and (3) immunization.

Experimental results of immunization tests with Loeffler's protective serum obtained from different localities are presented in tabular form. From these results it is concluded that the injection of large doses (100 to 200 cc.) of the antiserum is not only a means of protection but is also of value as a therapeutic agent in treating animals affected with the disease. The injection of small doses of serum yielded unsatisfactory results.

Aphthous fever, E. Leclainche (*Rev. Gén. Méd. Vét., 24 (1915), No. 281–282, pp. 201–210*).—The author reports that immunization against aphthous fever with antiserum does not give good results and is in general unreliable. Strict quarantine measures are indicated as being the most satisfactory means of combating the disease. All diseased and infected animals should be slaughtered and the infected district policed.

The "double zone system" of quarantine has given excellent results.

Foot-and-mouth disease, R. Graham (*Kentucky Col. Agr., Ext. Div. Circ. 28 (1914), pp. 3–8, figs. 5*).—A brief popular account furnishing information for the farmer.

Preliminary report on the conglutination test with special reference to the diagnosis of glanders, C. P. Fitch (*Jour. Amer. Vet. Med. Assoc., 48 (1916), No. 5, pp. 566–574*).—From the results obtained in testing over 300 horses by the conglutination, complement fixation, and agglutination reactions it is concluded that the complement fixation and conglutination tests are in many respects very similar. While both are relatively complex the reagents

for conglutination are more easily obtained than for complement fixation. The greater sensitiveness of the conglutination system, however, offsets this advantage.

The conglutination reaction has a decided advantage over complement fixation for the diagnosis of glanders in asses, mules, and those horses which have anticomplementary substances in their blood. No single sera test is deemed absolute for the diagnosis of glanders. The necessity of standardized methods for carrying out such diagnostic tests in various laboratories is emphasized, as tending to reduce the number of discrepancies in the results obtained by different workers.

The mallein conjunctival test, J. Marek (*Deut. Tierärztl. Wchnschr., 24 (1916), No. 5, pp. 43–48, figs. 4*).—The author reviews in detail the technique of the mallein ophthalmic test for glanders and discusses certain procedures which have yielded the best results. The interpretation of results is also considered.

Prophylaxis of glanders, V. Drouin (*Rev. Gén. Méd. Vét., 24 (1915), No. 281–282, pp. 210–226*).—The author reviews the subject in general and indicates the value of the subcutaneous mallein and ophthalmic reactions in the diagnosis of the disease. The complement fixation reaction is also recommended, but it is not deemed so valuable as the other diagnostic tests. In using these tests it is important to consider all symptoms in order to form a correct judgment for the diagnosis.

The usual sanitary measures should be observed and diseased horses slaughtered.

Excellent results have been obtained by the systematic subcutaneous use of mallein.

Administrative control of glanders, E. B. Ackerman (*Dept. Health N. Y. City, Reprint Ser., No. 16 (1914), pp. 13*).—This is a report of control work in New York City.

A case of tetanus favorably treated with magnesium glycerophosphate, Sittig (*Ztschr. Veterinärk., 27 (1915), No. 12, p. 368*).—After two subcutaneous injections of tetanus antitoxin without any favorable result, 50 cc. of a 25 per cent sterile solution of magnesium glycerophosphate was injected intramuscularly into a horse. The injection was repeated on the following day. The results of this treatment were most striking and prompt.

It is indicated that magnesium glycerophosphate is an excellent antitetanic even in the severest cases of the disease.

A preliminary report on the pathology of bovine actinomycosis, F. Griffith (*Rpts. Local Govt. Bd. [Gt. Brit.], Pub. Health and Med Subjs., n. ser., No. 107 (1915), pp. 11*).—This preliminary report deals with 50 frozen tongues and lymphatic glands from the lingual region, of which 46 were imported from Argentina, 2 from North America, and 2 from Siberia, and 44 fresh specimens from animals slaughtered in England. The results show that actinobacillosis is widespread and forms a considerable proportion of the cases of disease in oxen known under the name of actinomycosis.

An account of investigations on the subject by Hope has been previously noted (E. S. R., 31, p. 882).

Contagious abortion in cows, J. W. Kalkus (*Washington Sta. Popular Bul. 94 (1915), pp. 4*).—A brief account of this disease, with preventive and remedial measures.

Studies to diagnose a fatal disease of cattle in the mountainous regions of California, K. F. Meyer (*Jour. Amer. Vet. Med. Assoc., 48 (1916), No. 5, pp. 552–565*).—A preliminary account of work with a disease that occurs in California and Nevada, and which is thought to be bovine hemorrhagic septicemia.

The life history of Gongylonema scutatum, B. H. RANSOM and M. C. HALL (*Jour. Parasitology, 2 (1915), No. 2, pp. 80–86*).—This is a report of studies of the life history of the gullet worm of sheep and cattle, commenced in April, 1911, at which time investigations of the rôle of insects as intermediate hosts of helminths were undertaken.

"The eggs of *G. scutatum* present in the feces of sheep and cattle infested with the adult parasite hatch out when swallowed by insects of various species. The larvæ thus released from the eggs pass into the body cavity and reach the final larval stage in about a month. In this stage the larva is coiled into a spiral and is inclosed in a capsule about 0.5 mm. in diameter. The length of the fully developed larva is about 2 mm. and the esophagus equals about two-thirds the body length. The mouth, elongated dorso-ventrally, is surrounded by a flange-like chitinous border.

"Sheep fed upon insects containing these larvæ became infested with Gongylonema. A hog fed upon Croton bugs artificially infested by feeding with eggs of Gongylonema from cattle failed to become infested. A mouse, rabbit, and guinea pig fed with Gongylonema larvæ from beetles found in sheep manure, or from Croton bugs artificially infested by feeding Gongylonema eggs from cattle, also failed to become infested. Failure to produce infestation in these various animals indicates that the Gongylonema of sheep and cattle (*G. scutatum*) is not transmissible to hogs, mice, rabbits, or guinea pigs.

"Gongylonema larvæ have been found in various species of dung beetles collected from sheep manure, namely, *Aphodius femoralis, A. granarius, A. fimentarius, A. coloradensis, A. vittatus, Onthophagus hecate*, and *O. pennsylvanicus*. They have been developed in various species of Aphodius and in Croton bugs (*Ectobia germanica*) by feeding the eggs of *G. scutatum* from cattle. The feeding of eggs of Gongylonema from the gullet of a hog (presumably *G. pulchrum*) to Croton bugs also resulted in the development to encysted larvæ.

"Under natural conditions the usual intermediate hosts of *G. scutatum* are probably dung beetles of various species.

"The life history of *G. scutatum* is similar to that of *G. neoplasticum* of rats, mice, and other rodents, the intermediate stage of the latter having been found by Fibiger and Ditlevsen to develop in roaches (*Periplaneta americana, P. orientalis*, and *E. germanica*) and in a beetle (*Tenebrio molitor*). It is also similar to that of another rat and mouse parasite, *Spiroptera obtusa*, whose intermediate host was found by Leuckart and Marchi to be the larva of a beetle (*T. molitor*)."

Report of the veterinary department, R. A. CRAIG (*Indiana Sta. Rpt. 1915, pp. 70–75*).—Three commercial hog-cholera remedies were tested and found to possess absolutely no preventive or curative properties.

The effect of heat on the potency of antihog-cholera serum was investigated, with the result that the serum was found still to be potent after being heated for one hour at 58° C. An attempt was made to prepare a vaccine by mixing hog-cholera blood and antihog-cholera serum and heating in a water bath. This, however, failed to protect pigs, thus evidently conferring no immunity.

The virulence of blood from cholera hogs was tested at different periods in the disease by making tail bleedings in from 5 to 8 days from the date of inoculation. Eight-day virus was found to kill pigs in about 13 days, as compared to pen exposure, which kiled in 24 days.

The continued attempts to isolate a specific micro-organism from the hog-cholera blood and blood filtrates were unsuccessful.

On Blepharocorys equi sp. nov., a new ciliate from the cecum of the horse, I. C. SCHUMACHER (*Univ. Cal. Pubs., Zool., 16 (1915), No. 8, pp. 95–106, pl. 1*).—

This paper deals with the morphology of a new species, which is compared with the closely allied forms previously described.

Remarks on the diseases of foxes, I. E. CROKEN (*Amer. Jour. Vet. Med., 11 (1916), No. 3, pp. 195–197*).—A brief discussion of diseases of foxes, based upon the author's experience in Prince Edward Island where fox farming is carried on on a very large scale.

Practical application of the agglutination test, R. JONES (*Jour. Amer. Assoc. Instr. and Invest. Poultry Husb., 2 (1915), No. 3, pp. 22, 23*).—The practical application of this test on commercial farms in Connecticut was taken up in June, 1914, and continued until April, 1915, during which time 70 farms in 40 different cities and towns were visited and 14,609 birds tested.

The average infection for all flocks was 10 per cent, but the range was very great, running from none in the case of a few flocks to 56.3 per cent in the worst flock. That the lowest percentage of infection was found in the Leghorns is accounted for only by the natural resistance due to the activity and vitality of the breed. The hatchability of eggs and mortality of chicks seems to depend upon the size and vitality of the birds.

See also a previous note by F. S. Jones (E. S. R., 28, p. 887).

Suggestions to poultrymen concerning chicken pox, J. R. BEACH (*California Sta. Circ. 145 (1915), pp. 8, figs. 5*).—This circular deals particularly with preventive vaccination, with an announcement concerning the sale of vaccine by the university.

RURAL ENGINEERING.

Irrigation in the United States, R. P. TEELE (*New York and London: D. Appleton & Co., 1915, pp. IX+253, figs. 2*).—This book presents a nontechnical discussion of the legal, economic, and financial aspects of irrigation in the western United States, with chapters on the field for irrigation in the United States, historical information, climatic conditions in the arid region, water supply, crops, legislation relating to irrigation, irrigation investments, organization and operation of irrigation enterprises, and the present situation and future of irrigation in the United States.

The greater part of the book is devoted to a discussion of federal and state legislation relating to irrigation, irrigation investments, and organization and operation of irrigation enterprises. In these chapters the author has attempted to set forth, for the prospective investor in irrigated lands, water rights, irrigation bonds, stocks, etc., the exact nature of what is being offered to investors, particularly as to the security behind such investments.

The author expresses his belief in the feasibility of irrigation and in the possibilities of the West, but he points out that the interests of the West can not be advanced permanently by overstating the returns which are to be secured from irrigated lands or from securities behind irrigation investments. It is pointed out further that to-day large areas of land exist under projects either completed or under construction not yet under cultivation and irrigation, and with no effective demand for this land. "As it stands to-day, few, if any, of such enterprises, public or private, are paying any return on the capital invested. The great need of the West now is the utilization of the works already built, not more works. . . . Past experience and the present situation seem to indicate that irrigated lands can not be expected to repay directly the cost of irrigation works, with interest, as is ordinarily expected of investments generally. Past experience demonstrates, however, that if the loss to original investors is overlooked, irrigation has been a decided success."

To relieve the situation a system of local, state, and federal aid is favored by the author, the general features of which are suggested as follows: "(1) Provision for the segregation for reclamation of tracts of public land as is now done under the Carey Act; (2) provision for the reclamation of similar tracts of state or private lands, or of tracts partly public and partly private; (3) provision for the creation of districts composed of such lands, in general like the present irrigation districts; (4) provisions for the submission of proposals for the creation of such districts and the construction of works to supply the lands with water in somewhat the same manner as Carey Act proposals are now submitted; (5) provision for the approval of such proposals by all the contributing agencies and for the pledging of these agencies to contribute the amounts agreed upon; (6) provision for the issue of bonds which shall be made in lien on the lands of the districts to be enforced by taxation as is now done in irrigation districts; (7) provision for the disposal of lands to settlers subject to the bonds issued to secure funds for construction; and (8) provision for the enforcement of the lien on the land in case there is default in the payment of interest or principal."

Irrigation possibilities in Kansas, H. B. WALKER (*Bien. Rpt. Kans. Bd. Agr., 19 (1913–14), pp. 307–316, figs. 5*).—The author emphasizes the importance of first developing the areas of Kansas in which water may be obtained for irrigation by pumping from relatively small depths, and is of the opinion that farming methods, to utilize the available water supplies most economically, should be intensive.

Irrigation by pumping in Kansas: What Kansas is doing to develop irrigation, B. P. WALKER (*Bien. Rpt. Kans. Bd. Agr., 19 (1913–14), pp. 301–306, fig. 1*).—This is a brief sketch of the irrigation situation in Kansas.

[Alfalfa irrigation experiments] (*New Mexico Sta. Rpt. 1915, pp. 45–49, fig. 1*).—The amounts of water applied in irrigation experiments on 46 plats of alfalfa, conducted in cooperation with the Irrigation Investigations of this Department, are reported in tabular form. The plats varied in area from 1,980 to 14,040 sq. ft. An average of 0.38 acre-feet per acre per irrigation was applied to the first 28 plats and of 0.304 acre-feet per acre per irrigation to the remainder. Five irrigations were made. From the irrigation standpoint the results were deemed unsatisfactory.

Tests of a proportional weir (*Engin. News, 74 (1915), No. 22, pp. 1018, 1019, figs. 3*).—Tests of two proportional-flow weirs of the Rettger type (E. S. R., 31, p. 784) are reported, both being 3½ ft. long on the crest, but differing in height from the crest to the curve of the side.

The results as graphically reported indicate the approximate proportionality of discharge to head. For the higher heads (above 1 ft.), the coefficients of the smaller weir are about 2.4 per cent higher than for the larger weir. The gradual increase in coefficient as the head increased was found to be not due to velocity of approach.

Report of the acting commissioner for water conservation and irrigation for the year ended June 30, 1915, H. H. DARE (*Rpt. Act. Comr. Water Conserv. and Irrig. [N. S. Wales], 1914–15, pp. 109, pls. 16*).—This report covers the physical and financial status of established and projected irrigation schemes and the extent of artesian and shallow boring during the year from July 1, 1914, to June 30, 1915. Private works for the conservation and distribution of water for irrigation and stock watering purposes are also reported upon.

Annual report of the Water Supply Commission of Pennsylvania, 1914 (*Ann. Rpt. Water Supply Com. Penn., 1914, pp. 114+399, pls. 34*).—This reports the activities of the commission for 1914 and contains considerable hydro-

graphic data. An appendix gives the results of measurements of stream flow in the State in 1914.

Ground water in Lasalle and McMullen counties, Texas, A. DEUSSEN and R. B. DOLE (*U. S. Geol. Survey, Water-Supply Paper 375–G (1916), pp. 141–177, pls. 2, fig. 1*).—This report describes the geology, physiography, and water bearing formations of two areas of 1,180 and 1,707 square miles in southwestern Texas, and presents the results of an investigation of the ground waters of the areas with reference to their use for irrigation and domestic purposes.

Data from 131 wells in the two counties, together with analyses of the waters, are reported. These are taken to indicate "that strongly mineralized alkali waters abound in Lasalle and McMullen counties. Almost all the waters tested exceed 500 parts per million in total mineral content, and nearly two-thirds of them exceed 2,000 parts. Sulphate and chlorid waters predominate. Though only about one-quarter of the supplies are classed as sodium carbonate, more than half contain notable amounts of black alkali. Because of this generally excessive mineral content a large proportion of the waters are poor supplies, many being unfit for use. Drinkable waters have been found in many places, and a few are only moderately high in mineral content. In general, however, the region affords supplies carrying excessive contents of alkali. The waters must be called poor for use in boilers, because they would cause excessive foaming, though they would probably not be corrosive nor would they form much scale. The content of alkali of most of them is too great to render it advisable to irrigate with them, and many are unfit for such use."

A water-power reconnoissance in south-central Alaska, C. E. ELLSWORTH and R. W. DAVENPORT (*U. S. Geol. Survey, Water-Supply Paper 372 (1915), pp. 173, pls. 22, figs. 6*).—This reports in convenient form data on measurements of the volume of streams in the Bering River basin; the Controller Bay region; the basin of the lower Copper River and its principal tributary, the Chitina; in numerous localities in the Prince William Sound region; the Willow Creek district; and the eastern part of the Kenai Peninsula, together with compilations of the precipitation records made by the Weather Bureau of this Department. A separate report on a water-power reconnoissance in southeastern Alaska in 1909, by J. C. Hoyt, is appended.

Geo-hydrological studies and research in Italy in connection with agriculture, G. DE ANGELIS D'OSSAT (*Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases, 6 (1915), No. 4, pp. 517–521*).—The importance of the geologist in connection with drainage and irrigation work, in soil study, and in obtaining rural water supplies is pointed out, with reference to Italian rural conditions.

A bibliography of Italian literature bearing on the subject is appended.

Monograph on the irrigation wells of the Jaunpur District, A. C. WALKER (*Dept. Land Rec. and Agr. United Prov. Agra and Oudh, Agr. Ser., Bul. 32 (1915), pp. 56*).—This describes the wells and well irrigation in the district.

The peat resources of Wisconsin, F. W. HUELS (*Wis. Geol. and Nat. Hist. Survey Bul. 45 (1915), Econ. Ser. 20, pp. XVII+274, pls. 22, figs. 20*).—A general discussion of the origin, characteristics, and uses of peat is followed by a report of investigations into the location, extent, and character of the peat beds of Wisconsin by counties and the possibilities for their economic utilization.

Wisconsin is considered to have extensive peat resources, but it is stated that attempts at the development of peat industries in the State have been unsatisfactory. "The peat lands of Wisconsin in a number of instances are much more likely to be drained and reclaimed for agricultural purposes than they are to be used for their potential fuel value."

Cement and its manifold uses, E. A. TRECO (*Bien. Rpt. Kans. Bd. Agr., 19 (1913–14), pp. 448–457, figs. 10*).—Several of the uses of cement in farm structures are described and illustrated.

Effect of iron and calcium on concrete sand, T. SAVILLE (*Engin. News, 74 (1915), No. 26, p. 1242, figs. 2*).—In connection with a study of New Hampshire and Vermont sands and gravels, it was found that sands containing iron particles made a stronger mortar than ordinary sand, and sand containing considerable calcium carbonate made mortars stronger than those made from standard Ottawa sand.

Shrinkage and time effects in reinforced concrete, F. R. MCMILLAN (*Univ. Minn. Studies Engin., No. 3 (1915), pp. 41, pls. 3, figs. 17*).—Tests of long duration under load on a 5½ by 30 in. by 12 ft. reinforced concrete beam of 1:2:4 mixture, four 4 by 5 by 42 in. reinforced concrete beams of 1:2:4 mixture, a 6 by 8 ft. concrete slab reinforced two ways and of 1:2½:4 mixture, and a 10 by 10 ft. concrete slab reinforced one way and of 1:2:4 mixture, are reported, together with a test of three beams to determine the shrinkage under variable conditions of curing.

"With materials and mixtures as used in these tests it is safe to predict a shrinkage of from ¾ to 1 in. or more in 100 ft. when exposed to the ordinary dry air of a heated building. It can not be definitely stated when shrinkage will cease under these conditions, but certainly not within a year. However, from one-half to two-thirds of the amount indicated may be expected within 40 to 60 days after exposure to dry air. The effect of thorough wetting in the early curing stage seems to have no effect in reducing the total shrinkage, the only effect being to retard the beginning of the action, this in spite of the fact that the strength of the concrete is materially increased by this treatment. Slight changes in the moisture content in the air will retard the shrinkage or even cause a swelling, which seems to warrant the belief that structures open to the elements would never show the same total shrinkage as found in these tests.

"The continued shrinkage in beams and slabs acts to produce an increasing deflection, though not to the same extent as the time yielding. The yielding of the concrete under compressive stress with time . . . is greater as the unit stress is greater and seems to go on indefinitely. In these tests the deformation due to yielding was found to be from three to five times that produced immediately upon the application of the load. On the tension side of a beam or slab the effect of time is to cause a gradual increase in the steel stress from the breaking down of the concrete in tension or the failure of the bond. The combination of the extension at the bottom and a shortening at the top produces in beams and slabs a continually increasing deflection. With the same unit changes top and bottom the deflection is less the deeper the beam."

The most important possibility indicated by these tests is considered to be that of the production of high stresses in the longitudinal steel of compression members. "The time yielding of the concrete under stress, combined with the excessive shortening due to shrinkage, may result in deformations from five to fifteen times those expected from the ordinary calculations."

Hydrated lime in concrete road construction (*Good Roads, 48 (1915), No. 23, pp. 305–308, figs. 7*).—This is a review of some of the work done with hydrated lime in concrete pavement construction. The consensus of opinion based on these service tests seems in general to favor the use of hydrated lime on concrete roads.

Apparatus for measuring the wear of concrete roads, A. T. GOLDBECK (*U. S. Dept. Agr., Jour. Agr. Research, 5 (1916), No. 20, pp. 951–954, pl. 1, fig. 1*).—An instrument developed by the author in the Office of Public Roads and Rural

Engineering of this Department for measuring the wear of concrete roads is described in detail and illustrated. It "essentially consists of a fine wire stretched tightly across the road at a constant height, together with an inside micrometer for measuring the distance from the road surface to the wire. Measurements taken 1 ft. apart across the road permit the plotting of its cross section, and if these measurements are repeated at long intervals the change of cross section or the decrease in the thickness of the road will be revealed."

Public highways: Kansas roads, past, present, and future, W. S. GEARHART (*Bien. Rpt. Kans. Bd. Agr., 19 (1913–14), pp. 56–120, figs. 38*).—This article points out the benefits of good roads to Kansas farmers, and discusses in some detail the location, design, construction, maintenance, and financing of the different types of roads in Kansas.

Economic factors all important in rural highways, L. W. PAGE (*Engin. Rec., 72 (1915), No. 13, p. 385, fig. 1*).—The principal factors which affect the economic efficiency of an improved road, and upon which it is thought economic comparisons should be based, are discussed as cost of construction and maintenance, amount and character of traffic, and the average unit cost of hauling before and after the improvement is made. With special reference to the last factor, it is stated that "if the improvement is to be justified economically [the] total annual saving must be sufficient, after all costs for maintenance and repairs are deducted, to pay a reasonable interest on the original investment. . . . The State is much better circumstanced for planning and supervising road improvement work than are any of its political subdivisions."

A chart is shown which is intended to illustrate the scope of a model state organization. See also a note of a previous report along similar lines by Pennypacker (E. S. R., 33, p. 290).

Effects of varying mixture and ignition timing, V. R. GAGE (*Power, 42 (1915), No. 21, pp. 720–722, figs. 2*).—Indicator diagrams obtained from a 6-horsepower, 4-stroke cycle, hit-and-miss governed internal combustion engine, operating on different fuel mixtures and with the spark retarded or advanced, are given. These show that "not only maximum economy but also maximum power are obtained by adjusting the engine to run on as lean a mixture as possible, with the spark advanced only enough to overcome the lapse of time required for the mixture to burn and to overcome the electrical lag."

The Highland Society's exhibition trial of motor tillage implements at Stirling (*Impl. and Mach. Rev., 41 (1915), No. 488, pp. 926, 927*).—Trials of four tractor plowing outfits and one motor plow on uniform stiff clay soil and light soil, with grades varying from 1 in 7 to 1 in 30, are reported, in which it was attempted to simulate actual working conditions on the farm. It was required, however, that "the depth of furrow shall be not less than 8 in. and not more than 10 in. on the light land and not less than 6 in. on the stiff land."

It was found that "none of the tractors was successful in ascending the gradient on the plats originally assigned to them on the light land and had to be removed to a part of the field where the gradient was less severe. The presence of a liberal dressing of fresh manure on the surface added to the difficulty." It was concluded that the tractors are unable to do field work on a grade exceeding 1 in 20. Under the favorable weather conditions prevailing during the trials no appreciable packing by the wheels of the tractors was observed.

Test of a potato planter and coverer, A. NACHTWEH and K. VORMFELDE (*Mitt. Verb. Landw. Masch. Prüfungsanst., 9 (1915), No. 1, pp. 1–9, figs. 5*).—A two-row potato planter is described and diagrammatically illustrated, and tests are reported. The main feature of the planter is a traveling cup chain which lifts

a potato in each cup and drops it into a tube through which it passes into the furrow. The furrow is dug ahead of the seeder and the seed is covered by a pair of inclined disks.

In the tests it was found that on the average about ¼ hectare (0.61 acre) could be planted in an hour in a field 250 meters (820 ft.) long. No injury to the seed was observed. While it is concluded that such a planter is practical and useful, it is estimated that on a field of 15 hectares (37 acres) the costs of machine and hand planting will be about the same. It is thought probable, however, that a three- or four-row machine of this type on a larger field would cause considerable saving.

Points on the selection, adjustment, and care of farm machines, E. M. D. Bracker (*Oregon Sta. Bul. 133* (*1915*), *pp. 48, figs. 37*).—This is a popular discussion intended for the farmer and dealing in detail with factors relating to the selection of farm machines, types and adjustments of farm machines, and the care of farm machinery. A number of practical illustrations and other data are included.

The dairy barn and milk house, how to construct them, R. E. Hundertmark and A. B. Nystrom (*Washington Sta. Popular Bul. 95* (*1915*), *pp. 40, figs. 22*).—This bulletin describes and illustrates the shed, open shed, bank, and two-story types of dairy barn, and a convenient milk house, all of which are considered suitable for Washington conditions, and gives instructions as to design and construction, together with bills of materials.

The construction of shearing sheds and yards, compiled by J. W. Mathews (*Dept. Agr. N. S. Wales, Farmers' Bul. 91* (*1915*), *pp. 29, figs. 17*).—This bulletin describes and illustrates two sheep-shearing sheds, a combined shearing shed and grain store, and sheep yards for small flocks, and points out the factors to be considered in their planning.

Housing farm poultry, A. G. Philips (*Bien. Rpt. Kans. Bd. Agr., 19* (*1913–14*), *pp. 656–669, figs. 21*).—The substance of this article has been noted from another source (E. S. R., 27, p. 374).

Planning the farm in relation to the farmstead, J. B. Davidson (*Bien. Rpt. Kans. Bd. Agr., 19* (*1913–14*), *pp. 358–360, fig. 1*).—The author offers a sketch showing the routes to be traveled in performing the farm operations, this to serve as a basis for the best location of farm buildings, roads to the field, fences, etc.

Household conveniences and how to make them, C. E. Hanson and E. J. Fermier (*Texas Agr. Col. Ext. Serv. Bul. B. 8* (*1915*), *pp. 27, figs. 14*).—This bulletin describes and illustrates cold water and hot and cold water supply systems, a fireless cooker, evaporation cooler, cold box, fly traps and screen frames, ironing board, and kitchen wall cabinet.

Saving fuel in heating a house, L. P. Breckenridge and S. B. Flagg (*U. S. Dept. Int. Bur. Mines Tech. Paper 97* (*1915*), *pp. 35, figs. 3*).—This bulletin describes the different fuels used and methods for heating residences, discusses factors affecting the design of heating apparatus and governing the consumption of fuel and the convenience of operation, and gives general suggestions on the firing of different fuels, together with the results of house heating tests obtained from various sources. The most important points brought out in this study are as follows:

". . . Both convenience of operation [in heating a house] and consumption of fuel depend on the system of heating (and ventilation) installed, and convenience, fuel consumption, and first cost should be considered in making a selection. The heater should be large enough to meet continuously and without attention for periods of eight hours the demands for heat in all weather except the most severe.

"Heating equipment that burns satisfactorily and economically one kind or size of fuel may not be well adapted to burning another. Ascertain by experiment what fuel and what method of using it are best suited to [the] needs. . . .

"Attend to the fire regularly and try to anticipate the demands for heat. Keep the heat-absorbing surfaces of the heater free from soot and dust by regular cleaning. Heating systems often fail to meet the demand for heat in severe weather because of insufficient draft. To supply additional heat, the heater must be able to burn more coal. The more probable causes of insufficient draft are chimney not high enough, or having its top too near some tall object; chimney, smoke pipe, or gas passages of heater clogged with soot or débris, sometimes through the breaking of a partition between two flues in a chimney; leaky connection of smoke pipe to heater or to chimney; accidental closing of hand damper in smoke pipe; clogging of fuel bed by clinkers; and too great a length of horizontal smoke pipe between the heater and the chimney."

A list of available publications issued by the Bureau of Mines on fuel technology is included.

Water supply, plumbing, and sewage disposal for country homes, R. W. Trullinger (*Bien. Rpt. Kans. Bd. Agr., 19 (1913–14), pp. 361–413, figs. 38*).—The substance of this article has been noted from another source (E. S. R., 30, p. 690).

Rural sanitation, C. A. Magoon (*Washington Sta. Popular Bul. 93 (1915), pp. 60, figs. 30*).—This bulletin takes up the subject mainly from the bacteriological viewpoint, giving considerable information as to the protection of foods, water supplies, and dairy products, and describing briefly methods of well protection and sewage and garbage disposal.

A method of treatment of polluted farm water supplies with chlorid of lime is outlined as follows: "One tablespoonful of the chlorid of lime is dissolved in 10 qt. of water. This quantity is sufficient to treat 1,000 gal. of water and the operation is carried out by simply pouring the clear solution into the water to be treated and stirring thoroughly. This solution is a powerful germicide and its action is very rapid, ten minutes or sc being all the time required to carry out the purification."

Disposal of human excreta and sewage of the country home, T. Horton (*Mo. Bul. N. Y. State Dept. Health, 31 (1915), Nos. 8, pp. 237–243, figs. 2; 11, pp. 333–339, figs. 4*).—It is stated that as the main requirements a sanitary sewage disposal system for a country home should not be a nuisance, a menace to health, nor the source of an esthetic objection. Its operation should not be affected by freezing weather and it should be convenient. On the basis of these requirements two dry-earth privies, one with a vault and the other with a removable container; two types of cesspools; and a settling tank and tile absorption system, are described and illustrated.

The disposal of household wastes, W. P. Gerhard (*New York: D. Van Nostrand Co., 1915, 3. ed., pp. 195, figs. 4*).—This book discusses the disposal of sewage, garbage, and ashes, chiefly from the farmer's and householder's point of view.

RURAL ECONOMICS.

Constructive rural sociology, J. M. Gillette (*New York: Sturgis & Walton Co., 1916, new ed., rev. and enl., pp. XIX+408, figs. 8*).—This is a revised edition of the book previously noted (E. S. R., 28, p. 595). It contains an additional chapter on the physical condition of the United States and agriculture, and a number of new topics under the individual chapters. The material has been

slightly revised and brought up to date by the use of more recent data furnished by the 1910 Census.

Germany's food supply, W. J. ASHLEY (*Quart. Rev., 224 (1915) No. 445, pp. 444–462*).—This article points out the source of various products going to make up Germany's food supply, and the influence of the war in changing the quantity of the products. The author believes the effect will have a greater influence upon the supply of live stock, and therefore on the meat and dairy products, than upon other agricultural products, since the larger proportion of the crops will be consumed direct without being transformed into milk or meat.

Permanent agriculture and social welfare, T. F. HUNT (*U. S. Senate, 64. Cong., 1. Sess., Doc. 239, pp. 8*).—This address, delivered in 1915 before the National Association of Real Estate Exchanges at Los Angeles, and before the Farm Management Association at the University of California, presents the following propositions:

(1) American farms must be recapitalized at least three times in a century. (2) The open country can not afford to support numerous social, religious, or racial divisions. (3) The country population of one generation determines the character of the city population in the next generation. (4) Land credit, popularly known as rural credit, is a means of creating a permanent agriculture by putting farm mortgages on an investment basis.

The author also states that farming is the one great industrial occupation in the United States where children are of economic advantage and that training which children obtain in thus contributing to the family income is a factor of great importance to society. In the long run it is of no particular advantage to any person to own a farm unless he intends to raise thereon a successful family. With these propositions as a basis he argues that there should be established a type of rural credit that will tend toward a great stability in the rural population through enabling the young men with but small means to purchase a farm and to pay for it through a long series of years.

Grain farming in the corn belt with live stock as a side line, C. VROOMAN (*U. S. Dept. Agr., Farmers' Bul. 704 (1916), pp. 48, figs. 5*).—The author, writing from the standpoint of the farmer farming for a living, states that to make a money-maker of a farm that has become a losing proposition through steady grain farming, in addition to raising standard grain crops it is necessary to grow legumes, raise live stock as a side line, keep accounts of receipts and expenditures, "mix horse sense with scientific agriculture, thus adapting the new methods to changes in market, weather, and other conditions," try to secure enough capital, pursue a consistent policy, confer with the county agent, and study other available information.

Specific suggestions along these lines are given.

Chemung County, an account of its agriculture and of its farm bureau, M. E. CHUBBUCK and G. P. SCOVILLE (*Farm Burs. N. Y. Circ. 7 (1915), pp. 38, pls. 4, figs. 2*).—This circular in the main consists of a report of the farm management surveys made by the county agent. The farms have been divided into two classes, called the hill and valley farms, and the data gathered extend over several years.

The authors conclude that neither the size of business, crop yields, quality of live stock, nor diversity of business, alone, is the determining condition in the success of a farm. Size is perhaps the most important factor, but a large business conducted without attention to quality of live stock or diversity of enterprises may result in a loss.

The requirements suggested as necessary for a farm to be as good or better than the average in the county are, for a hill farm, 380 units of size, 26 per

cent of the man work days applied on enterprises other than stock for diversity, milk receipts of $56 per cow, and crop yields of 100 per cent. For the valley farm the corresponding figures are 479 units of size, 37 per cent of man work, $83 of milk receipts, and 100 per cent of crop yield.

The circular also contains a number of suggestions as to methods that may be adopted to improve agriculture in the county, and a brief history of the county agent work from its beginning in 1912 .

Farm leases in Iowa, O. G. Lloyd (*Iowa Sta. Bul. 159 (1915) abridged, pp. 30, figs. 5*).—This is an abridged edition of the bulletin previously noted (E. S. R., 34, p. 193).

The American Farm Management Association (*Amer. Farm Management Assoc. Proc., 5 (1914), pp. 95, pls. 2, figs. 4*).—This contains the proceedings of the annual meeting for 1914, including the addresses and reports previously noted (E. S. R., 32, p. 292), and an address entitled Farm Organization Investigations and Their Relation to the Farm Survey, by W. J. Spillman.

The direct marketing of farm produce, B. H. Hibbard and A. Hobson (*Hoard's Dairyman, 50 (1916), No. 26, pp. 857, 859–865, figs. 9*).—This article deals primarily with marketing by parcel post, and treats of types, quality, and packing of produce, the establishment of the proper relationship between producer and consumer, rates by parcel post and express, and methods of transacting the business.

Suggestions for parcel post marketing, L. B. Flohr (*U. S. Dept. Agr., Farmers' Bul. 703 (1916), pp. 19, figs. 8*).—This contains suggestions for persons desiring to sell or buy produce by parcel post, and discusses methods of bringing the producer and consumer into business contact, the parcel post zones, rates, and regulations, methods of conducting the business, and preparing produce for shipment.

Farmers' market bulletin (*North Carolina Sta., Farmers' Market Bul., 3 (1916), No. 14, pp. 22, fig. 1*).—This gives the usual list of farm products for sale, and brief discussions of the market for soy beans, market price of North Carolina corn, and the movement to promote rural credit within the State.

[Agricultural statistics for the United Kingdom, 1900–1914] (*Statis. Abs. United Kingdom, 1900–1914, pp. 94–317*).—These pages contain statistical data for 1900–1914 relative to the average prices of British wheat, barley, and oats in England and Wales in each month, together with the acreage, total production, and average yield of crops and number of live stock for Great Britain and Ireland.

Imports and exports of corn, live stock, and other agricultural produce (*Bd. Agr. and Fisheries [London], Agr. Statis., 49 (1914), No. 4, pp. 276–366*).—This report gives statistical data showing for a series of years the quantity and value of the imports and exports of Great Britain as well as the country of origin or destination.

[Agricultural statistics of Denmark] (*Statis. Aarbog Danmark, 20 (1915), pp. 36–60*).—This yearbook contains information along the lines previously noted (E. S. R., 32, p. 594), adding data for the crop year ended June 30, 1915.

[Agriculture in Chosen] (*Ann. Rpt. Reforms and Prog. Chosen (Korea), 1913–14, pp. 94–105, pl. 1*).—These pages show the extent of agricultural production, the number of live stock, the utilization of water for irrigation, and the work of the experiment and seedling stations and of the Oriental Development Company. This company is organized under government supervision for the encouragement of skilled farmers and others as immigrants, and furnishes them with necessary funds.

A B C of Queensland statistics, 1915, compiled by N. J. MacLeod (*Brisbane: Govt., 1915, pp. 42*).—This continues data previously noted (E. S. R., 32, p. 288).

AGRICULTURAL EDUCATION.

Annual report of the state director of industrial education to the superintendent of public instruction, 1915, MANETTE A. MYERS (*Ann. Rpt. State Dir. Indus. Ed.* [*N. Mex.*], *2* (*1915*), *pp. 218, figs. 91*).—This report includes a general survey of industrial education in New Mexico, including instruction in agriculture and home economics, an account of the history and organization of boys' and girls' club work in the State, and notes on the progress of instruction in agriculture, home economics, etc., in the schools of the various counties.

Agricultural education, J. E. METZGER (*Md. Agr. Col. Bul., 11* (*1914*), *No. 3, pp. 30, figs. 12*).—This bulletin offers suggestions for school officers and instructors as to courses of study, including an outline of a 4-year course, equipment, laboratory and field work, and community work for agricultural high schools, based on observations made by the author on a tour of the agricultural high schools of Maryland. An appendix gives directions for organizing boys' and girls' agricultural clubs.

[Agricultural instruction in the public schools of New Hampshire], G. H. WHITCHER (*N. H. Dept. Pub. Instr. Inst. Circs. 1913–14, No. 11, pp. 22; 1915–16, Nos. 44, pp. 3; 46, pp. 13, figs. 5; 47, pp. 9, figs. 5*).—These circulars outline instruction in home mixed fertilizers, soils, and agriculture extending through two years for the secondary schools of New Hampshire.

Outlines for high school agriculture, R. K. FARRAR, M. H. HOFFMAN, and E. C. BISHOP (*Des Moines, Iowa: Dept. Pub. Instr., 1915, pp. 154, figs. 113*).—These outlines are for the guidance of superintendents and teachers in organizing and conducting agricultural classes in Iowa high schools.

The one-year course includes studies in farm crops, soils, farm management and rural economics, dairying, horticulture, and farm animals. It comprises 180 lessons arranged in a sequential order and is planned for three recitations and two laboratory periods a week. A seasonal arrangement is also presented. In a suggested distribution of work for a half-year course it is recommended that farm crops and soils be required subjects, with either dairying, horticulture, or farm animals, according to local conditions, as an elective. A minimum price list of apparatus for high school agriculture and a list of reference literature are appended.

Syllabus of a course in agriculture for the use of teachers and students in the high schools of North Dakota, M. C. JAMES, G. W. RANDLETT, and C. C. SCHMIDT (*Bismarck, N. Dak.: Dept. Pub. Instr., pp. 64*).—Part 1 of this pamphlet offers suggestions to teachers on methods of teaching and equipment of libraries and laboratories. Part 2 consists of an outline of a course of study, with references arranged under the topics of the plant, special plants or farm crops, horticulture and forestry, animal husbandry, animal nutrition, the soil, and the farm home and the farm community. Part 3 is a students' laboratary manual comprising 75 exercises.

Farm and school problems for high schools and normals, H. L. GOLL (*Columbus, Ohio: The Heer Press, 1915, pp. XV+538, figs. 102*).—This book contains a scientific discussion of the essential facts in agriculture and an economic study of the factors of greatest influence affecting the various operations of the farm. It comprises four parts, dealing respectively with soils, plants, animals, and farm management, including arithmetical problems, experiments, reference tables, review questions, and lists of publications for reference.

Field and laboratory studies of soils, A. G. MCCALL (*New York: John Wiley & Sons, Inc., 1915, pp. VIII+77, pls. 2, figs. 33*).—This elementary manual con-

sists of 35 exercises in the study of soils, and is intended to furnish sufficient material for the equivalent of one period a week throughout the year.

Fungoid diseases of farm and garden crops, T. Milburn and E. A. Bessey (*London and New York: Longmans, Green & Co., 1915, pp. XI+118, figs. 32*).—This book presents for the student and the agriculturist a brief discussion of each of the more important diseases of the common field and garden crops, together with preventive measures. A general explanation of a few botanical terms is included.

The horse in health and disease, F. B. Hadley (*Philadelphia and London: W. B. Saunders Co., 1915, pp. 261, pl. 1, figs. 69*).—This manual, which is designed as an introductory text to the study of veterinary science in agricultural schools and colleges consists of two parts, dealing respectively with the anatomy and physiology of the horse and with the causes, methods of prevention, and effects of diseases.

Illustrated lecture on the production of clean milk (*U. S. Dept. Agr., States Relations Serv. Syllabus 18 (1915), pp. 18*).—This syllabus, intended for the use of farmers' institutes and other extension lecturers, comprises the following topics: Definition of clean milk, bacteria in milk, sources of milk contamination, importance of clean milk to the consumer and the producer, the cost of milk, how to produce clean milk, scoring dairy farms, transportation, and literature. A list of 49 lantern slides designed to illustrate the lecture and a list of references to literature on the subject are appended.

Elementary domestic science.—II, Foods; advanced cookery, Sarah W. Landes (*Stillwater, Okla.: Students Supply House, 1915, pp. 187*).—This volume consists of a compilation of recipes. Volume 1 has been previously noted (E. S. R., 22, p. 594).

Home making and home keeping, Grace J. Ferguson (*San Juan, P. R.: Dept. Ed., 1915, pp. XI+278, pls. 4, figs. 23*).—This text in the elementary principles and practice of cooking, sewing, laundering, care and feeding of babies and small children, and care of the house has been prepared by the supervisor of home economics for the two-year course in the public schools of Porto Rico Five 50-minute periods are allowed each week for this study, three of which are to be devoted to cooking and two to sewing. The course for each year is divided into nine sections, one for each school month.

Home management, Neale S. Knowles, Louise H. Campbell, and Mabel C. Bentley (*Iowa State Col. Agr. Ext. Dept., Home Econ. Bul. 6 (1915–16), pp. 18, figs. 4*).—This is a topical outline for the study of the division of income and care of the home.

[Nature study and elementary agriculture for the elementary schools of New York] (*Cornell Rural School Leaflet, 9 (1915), No. 1, pp. 340, pl. 1, figs. 251*).—This issue for teachers contains subject matter, prepared by specialists in nature study and elementary agriculture, for 1915–16 as outlined in the New York state syllabus for elementary schools. It includes lessons on poultry, horses, cows, calves, and corn; studies of other animals, cultivated plants, and weeds, as well as of birds, insects, and trees; suggestions for the observation of Corn Day; a brief statement of the chief reasons for holding the exhibition of school and home work in agriculture at Cornell University during the farmers' week, and requirements and suggestions for the preparation of the 1916 exhibit; and suggestive material for teachers interested in outdoor study.

[Nature study and agriculture for the elementary schools of New York] (*Cornell Rural School Leaflet, 9 (1915), No. 2, pp. 341–376, figs. 15*).—This issue is for boys and girls and comprises suggestions for the observance of Corn Day and making seed collections, rules for farmers' week exhibit at Cornell University, etc.

Some fundamental propositions for nature-study, M. A. Bigelow (*Nature-Study Rev., 11 (1915), No. 9, pp. 410–412*).—In the propositions submitted the author defines the scope, aim, and organization of nature study, designating elementary agriculture as a special subdivision of "introduction to science" in grades 7 to 9.

The school garden a laboratory for industrial education, Alice V. Joyce (*Nature-Study Rev., 11 (1915), No. 8, pp. 361–364*).—The author suggests how the school garden may be made a laboratory for industrial education, and points out some of its teachings and effects on the pupil.

School gardening in the Philippines, N. H. Foreman (*Nature-Study Rev., 11 (1915), No. 8, pp. 356–361*).—The author gives an account of the school and home garden work and its results in the Philippines. This work is centered around the double purpose of giving the pupil a knowledge of plant life and a liking for good wholesome work, and of increasing the quality and quantity of food available for the family. Corn and tree planting campaigns and garden days or small agricultural fairs are important features. Gardening is a prescribed subject in the curriculum of the primary and intermediate schools in the Philippines except in such as are especially organized to give superior training in some one other industrial line.

MISCELLANEOUS.

Annual Report of Idaho Station, 1915 (*Idaho Sta. Bul. 84 (1915), pp. 47*).—This contains the organization list, reports by the director and heads of departments, the experimental features of which are for the most part abstracted elsewhere in this issue, and a financial statement for the fiscal year ended June 30, 1915.

Twenty-eighth Annual Report of Indiana Station, 1915 (*Indiana Sta. Rpt. 1915, pp. 87*).—This contains the organization list, reports of the director and heads of departments, the experimental features of which are for the most part abstracted elsewhere in this issue, and a financial statement for the federal funds for the fiscal year ended June 30, 1915, and for the remaining funds for the period ended September 30, 1915.

Twenty-eighth Annual Report of Michigan Station, 1915 (*Michigan Sta. Rpt. 1915, pp. 187–353, figs. 15*).—This contains reports of the director and heads of departments on the work of the station during the year, the experimental features of which are for the most part abstracted elsewhere in this issue; a financial statement for the fiscal year ended June 30, 1915; reprints of Bulletin 274, Special Bulletins 72 and 73, and Circulars 25–27, all of which have been previously noted; and the text of the principal state legislation relating to the Michigan College and Station and the State Board of Agriculure.

Twenty-sixth Annual Report of New Mexico Station, 1915 (*New Mexico Sta. Rpt. 1915, pp. 81, figs. 4*).—This contains the organization list, a report of the director on the work, publications, and exchanges of the station, including reports of heads of departments, the experimental features of which have been for the most part previously noted or abstracted elsewhere in this issue, and a financial statement for the federal funds for the year ended June 30, 1915.

Twenty-eighth Annual Report of New York Cornell Station, 1915 (*New York Cornell Sta. Rpt. 1915, pp. LXXXIX+1037, pls. 13, figs. 353*).—This contains the organization list, reports of the director of the station and heads of departments, and reprints of Bulletins 283 (revised), and 353–360, Memoirs 5–8, and Circulars 12 (reprint), and 27–31, all of which have been previously noted, and of Bulletin 291 (revised) and 361, abstracted elsewhere in this issue.

Twenty-fifth Annual Report of Washington Station, 1915 (*Washington Sta. Bul. 127* (*1915*), *pp. 59, figs. 15*).—This contains the organization list, a report of the work and publications of the station during the year, and a financial statement for the fiscal year ended June 30, 1915. The experimental work reported is for the most part abstracted elsewhere in this issue.

Monthly bulletin of the Western Washington Substation (*Washington Sta., West. Wash. Sta., Mo. Bul., 3* (*1916*), *No. 11, pp. 16*).—This number contains brief articles on the following subjects: Good Varieties of Fruits and Vegetables, by J. L. Stahl; Farm Crop Report, by E. B. Stookey (see p. 736); Comparison of Methods of Managing Pullets, and Station Flocks Respond to Special Management, by Mrs. G. R. Shoup (see p. 770); Bee Troubles, by J. W. Ware; and Ground Lime Rock.

Index to Special Bulletins, Volume III, and Paint Bulletins 5 and 6 (*North Dakota Sta., Spec. Bul., vol. 3, Index, pp. 409–416*).

A brief statutory history of the United States Department of Agriculture, F. G. CAFFEY (*Case and Comment, 22* (*1916*), *Nos. 9, pp. 723–733; 10, pp. 850–856, fig. 1*).—This article summarizes the history of this Department and its various activities from a legal standpoint, including a discussion of the constitutionality of the legislation.

Proceedings of the third annual conference of the American Association of Agricultural College Editors, 1915 (*Proc. Amer. Assoc. Agr. Col. Editors, 3* (*1915*), *pp. 62*).—This contains the addresses, reports, and papers given at the third annual conference of this Association, previously noted (E. S. R., 33, p. 496), with a preliminary statement in regard to the first and second conferences.

Ground-levels in democracy, L. H. BAILEY (*Ithaca, N. Y.: Author, 1916, pp. 95*).—This book contains the following material: The Science Spirit in a Democracy (pp. 7–27), the president's address before the American Nature Study Society, December 30, 1915; The Forthcoming Situation in Agricultural Work, I. The Public Foundations (pp. 29–56), II. The Nonpublic Foundations (pp. 57–88), these being respectively the vice-president's addresses before Section M of the American Association for the Advancement of Science previously noted (E. S. R., 32, p. 102; 34, p. 396); and Efficiency and Centralization (pp. 89–95), a part of an address before the Four-State Country Life Conference, February 7, 1916.

Interpolation as a means of approximation to the gamma function for high values of n^1, R. PEARL (*Science, n. ser., 41* (*1915*), *No. 1057, pp. 506, 507*).—A series of computations is reported, from which it is concluded that "the interpolation method, when third differences are used, gives values slightly better than those by Forsyth's method[a] when $n \overline{>} 25$. For $n=75$ or more the interpolation method using only second differences gives an approximation sufficiently close for all practical statistical purposes. As to the labor involved, there is no great amount of choice between Forsyth's and the interpolation method, but on the whole there appears to be a distinct, if small, advantage in favor of the interpolation."

The farmers' guide book, C. S. PALMER (*Buffalo, N. Y.: The Hammond Press, 1915, pp. 191*).—This book is intended as "a ready reference book of useful facts and rules for American farming," and contains a wide range of data.

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[a] Rpt. Brit. Assoc. Adv. Sci., 1883, p. 47.

NOTES.

Delaware College and Station.—F. B. Hills, assistant professor of animal husbandry and assistant animal husbandman, has resigned to take charge of the publicity work of the American Guernsey Cattle Club. H. V. Cory, instructor in poultry husbandry in Rutgers College, has been appointed instructor in poultry husbandry beginning July 1.

Idaho Station.—Ramsay M. Walker, of Wallace, has succeeded Herman J. Rossi as a member of the State Board of Education.

The semi-monthly Agricultural Newsletter which heretofore has been sent only to newspapers is now being sent to the entire station mailing list. Through this Newsletter frequent announcement is made of available and new publications, which are now sent out only in response to direct request.

The limited area of the State in which corn can be successfully grown necessitates the extensive use of crops other than corn for silage purposes. The station is entering upon its second year of experimentation with mixtures of legumes and small grains for the silo. Valuable feeding data were obtained last year from the college dairy and beef herds with wheat and vetch and with oat and pea silage in comparison with corn ensiled alone.

The department of agricultural chemistry has entered upon an investigation of the chemical changes which these crops undergo in the silo. The work will have for its immediate object the determination of the end products of carbohydrate fermentation and of the characteristic nitrogen compounds which constitute the total crude protein. A beginning is also being made in the field of animal nutrition. The work is under the immediate supervision of Ray E. Neidig, recently of the Iowa College, and of H. P. Fishburn, who is now at the University of Missouri for advanced work in physiological chemistry.

The influence upon quality in wheat of a crop rotation that will make available large quantities of soil nitrogen is the primary object of an extensive series of field plats just being initiated. Previous experiments at one of the substations has emphasized a distinct relationship between available soil nitrogen and the protein content of the matured grain. It is believed that the series of experiments just initiated will eventually answer questions relative to the possibility of producing in the Palouse country a better quality of milling wheat.

Illinois University and Station.—The new genetics building is completed, and experiments with about 1,500 mice are in progress as to the transmission of characters in animals. Plans are under way for a horticultural field laboratory.

Thomas J. Burrill, Ph. D., LL. D., professor of botany emeritus, died in April at the age of 77 years. Dr. Burrill came to the university within a month after its opening, serving continuously until his retirement in 1912. During this long period he had filled the following positions: Assistant professor of natural history, 1868–1870; professor of botany, 1870–1912; professor of horticulture, 1870–1903; botanist of the station, 1888–1903; dean of the college of science, 1878–1884; dean of the general faculty, 1894–1901; dean of the graduate school, 1894–1905; vice-president of the university, 1879–1912; and acting president for various periods aggregating nearly five years.

Michigan College.—A gift of $100,000 has been made by R. E. Olds for the rebuilding of the engineering building destroyed by fire March 5. The new structure is to be known as the R. E. Olds Hall of Engineering.

Minnesota University and Station.—The former divisions of economic entomology and of vegetable pathology and botany have been given the titles of (1) economic zoology and (2) plant pathology and agricultural botany, respectively.

C. W. Glotfelter, of Waterville, has been appointed a member of the board of regents, vice B. F. Nelson, whose term expired April 1. F. B. Snyder and Pierce Butler, whose terms expired at the same time, were reappointed.

R. M. West, assistant professor of agricultural chemistry and assistant chemist, has resigned to become secretary of the State Department of Agriculture, effective on March 1. Miss Mildreth J. Haggard, chemist in animal nutrition investigations, resigned to take effect May 1. J. J. Willaman has been promoted from instructor to assistant professor of agricultural chemistry and placed in charge of the section of agricultural analysis. C. H. Bailey, cereal technologist of the station, has been given a year's leave of absence, in order to take up work in the research laboratory of the State Grain Inspection Service.

Nebraska University and Station.—W. W. Burr, of the Office of Dry-land Agriculture of this Department, has been appointed professor of agronomy and head of the department of agronomy, beginning July 1.

New Jersey College and Stations.—Dr. Julius Nelson, professor of biology and biologist since 1888, died February 15 at the age of 58 years. Dr. Nelson was born at Copenhagen, Denmark, and was graduated from the University of Wisconsin in 1881. In 1883 he received the M. S. degree from the same institution, and in 1888 that of Ph. D. from Johns Hopkins University. His best known station work is his long-continued study, under a state appropriation, of oyster culture.

North Dakota Station.—L. R. Waldron, superintendent of the Dickinson substation since 1905, has been appointed in charge of the crop-breeding work at the main station and has been succeeded at Dickinson by John C. Thysell.

Texas Station.—T. W. Buell, superintendent of the Denton substation, has resigned to engage in farming. He has been succeeded by V. L. Cory, superintendent of the Lubbock substation, and he in turn by R. E. Karper, assistant agronomist of the Oklahoma College and Station.

Washington Station.—An additional substation has been established at Lind, Adams County, to be known as the Adams Branch Station. This substation is planned especially for studies in dry-land agriculture and was acquired through appropriations from the county board of commissioners, supplemented by gifts from a railway company and various individuals. A foreman's cottage, barn, and laboratory and office building have been erected, and crop and tillage experiments are under way. M. A. McCall has been appointed superintendent of the substation.

A temporary substation has also been opened at Winthrop for the study of animal diseases. A laboratory for the purpose has been erected.

Wisconsin University and Station.—The department of experimental breeding has recently occupied its new barn which has been especially designed for experimental purposes. The barn contains accommodations for about 20 cattle and has a floor space 36 by 63 feet.

The demonstration farm at Sparta is to be transferred to Hancock, where a site of 25 acres, provided by the Hancock Advancement Association, is to be utilized.

W. J. Geib, of the Soil Survey of this Department, has been appointed assistant professor of soils.

Association of American Agricultural Colleges and Experiment Stations.—The next meeting of this association will be held at Washington, D. C., November

15 to 17. It is expected that special prominence will be given on the general program to a discussion of some of the administrative features of the Smith-Lever Act, the development of home economics work, especially along extension lines, and the enlargement of military service in the land-grant colleges under the recent Federal legislation for increasing the military resources of the country.

National Agricultural Society.—This society was formally organized in New York City, April 27, the purpose stated in press reports being that of serving as the mouth-piece of the farmers of the United States in agricultural questions of nation-wide interest. Hon. James Wilson, of Iowa, former Secretary of Agriculture, was elected president; Theodore N. Vail, of Vermont, vice-president; G. Howard Davison, of New York, chairman of the executive committee; and T. Coleman DuPont, of Delaware, John A. Spoor, of Chicago, R. V. Lindabury, of New Jersey, Hon. William H. Moore, of New York, Governor H. C. Stewart, of Virginia, Senator James W. Wadsworth, of New York, and Fairfax Harrison, president of the Southern Railway, as members of the board of directors.

The society has begun the publication of the *Agricultural Digest*. This is a monthly which summarizes the important happenings in agriculture, and contains announcements, notes, signed editorials by a number of prominent agricultural workers, and similar material.

Southern States Conference on Secondary Agricultural Education.—The second conference on secondary agricultural instruction for the Southern States was held at New Orleans, La., April 17. The attendance aggregated about fifty, all the Southern States being represented. The conference was a joint undertaking between the States Relations Service of this Department and the U. S. Bureau of Education, and included professors of secondary education in state universities as well as supervisors of secondary agricultural instruction in state departments of public instruction.

C. H. Lane summarized some of the more important happenings in connection with teacher training that had taken place at similar conferences held in the North Atlantic and North Central States. He also stated that the aim of this conference was to work out a tentative course which may be taken as a guide for training teachers in agriculture, and when revised and tested, may be made the basis for licensing teachers in lieu of the present required examinations. The more important features of this course include a minimum for the first two years of agricultural subjects 24 hours, science 24 hours, humanistic subjects 15 hours, electives from agriculture 6 hours, and optional 3 hours. The minimum for the junior and senior years is agricultural subjects 12 hours, sciences 12 hours, humanistic subjects 12 hours, professional (education) 9 hours, special methods in secondary agricultural instruction 12 hours, electives from the foregoing groups 9 hours, and optional 6 hours. The course presented and in general approved by the conference also provided for general courses in the first two years of from 3 to 4 hours in field and forage crops, soils and fertilizers, animal husbandry and dairying, horticulture and forestry, and farm machinery, including shop and farm practice.

The report of the committee on annual conferences and programs, approved by the conference, recommended the continuation of the conferences, which have been found most useful in providing standards in agricultural teaching. It was thought that the conference should hereafter meet with the Conference for Education and Industry in the South, and that its next subject should be The Supervision of Agricultural Teaching. The belief was expressed that the proceedings should be published and distributed as widely as possible. Some action should be taken to insure the adoption of the recommendations of the

conference and to follow up its work. Reports to the Bureau of Education and the Department of Agriculture as to the success of courses tested, with recommendations for modifications or changes, were suggested.

The report of the committee on institutional relations, also approved by the conference, recommended that only four-year college courses, substantially as outlined by the conference, be recognized by state departments of education for professional licenses to teach agriculture in secondary schools without further examination. It was believed that much less work should be required for teachers of agriculture in elementary schools, and that such training should be done in normal schools and secondary agricultural schools. The training of secondary teachers of agriculture, however, it was thought should be done in the agricultural colleges, universities, and other institutions of like grade equipped with full departments of agriculture and education.

A conference with normal schools and secondary schools of agriculture to determine a well defined course in agriculture for teachers in elementary schools was favored.

Necrology.—Prof. George E. Patrick, chief of the dairy laboratory of the Bureau of Chemistry of the U. S. Department of Agriculture since 1901, died at Washington, D. C., March 25 at the age of 64 years. Professor Patrick was a native of Massachusetts and a graduate of Cornell University in 1873 (M. S., 1874). He served as instructor in chemistry in Cornell University from 1873 to 1874, as assistant professor and professor of chemistry in the University of Kansas from 1874 to 1883, as chemist of the Iowa Station from 1888 to 1895, and as assistant professor of agricultural chemistry in the Iowa College from 1890 to 1895, when he began his service with this Department. His work was largely with the chemistry of dairy products, and he had had much service as associate referee and referee of the Association of Official Agricultural Chemists in this connection.

Dr. Harry M. Hart, inspector of cattle at El Paso, Tex., for the Bureau of Animal Industry of this Department, was killed March 9 at Columbus, N. Mex., in the raid by Mexican bandits. He was a 1906 graduate of the college of veterinary medicine of the Ohio State University and had been in the service of this Department since graduation.

The recent deaths are noted of Samuel Johnson, professor of agriculture in the Michigan College from 1880 to 1889, and the first agriculturist of the station; W. W. Cooke, assistant biologist of the Biological Survey of this Department and one of the leading authorities on bird migration and distribution; Charles A. Davis, peat expert of the U. S. Bureau of Mines, and known especially for his studies of peat and related subjects; and Thomas H. Cunningham, inspector of fruit pests for British Columbia.

It is reported that Kenneth R. Lewin, protozoologist at the Rothamsted Experiment Station since 1913, was killed in the European War, March 9.

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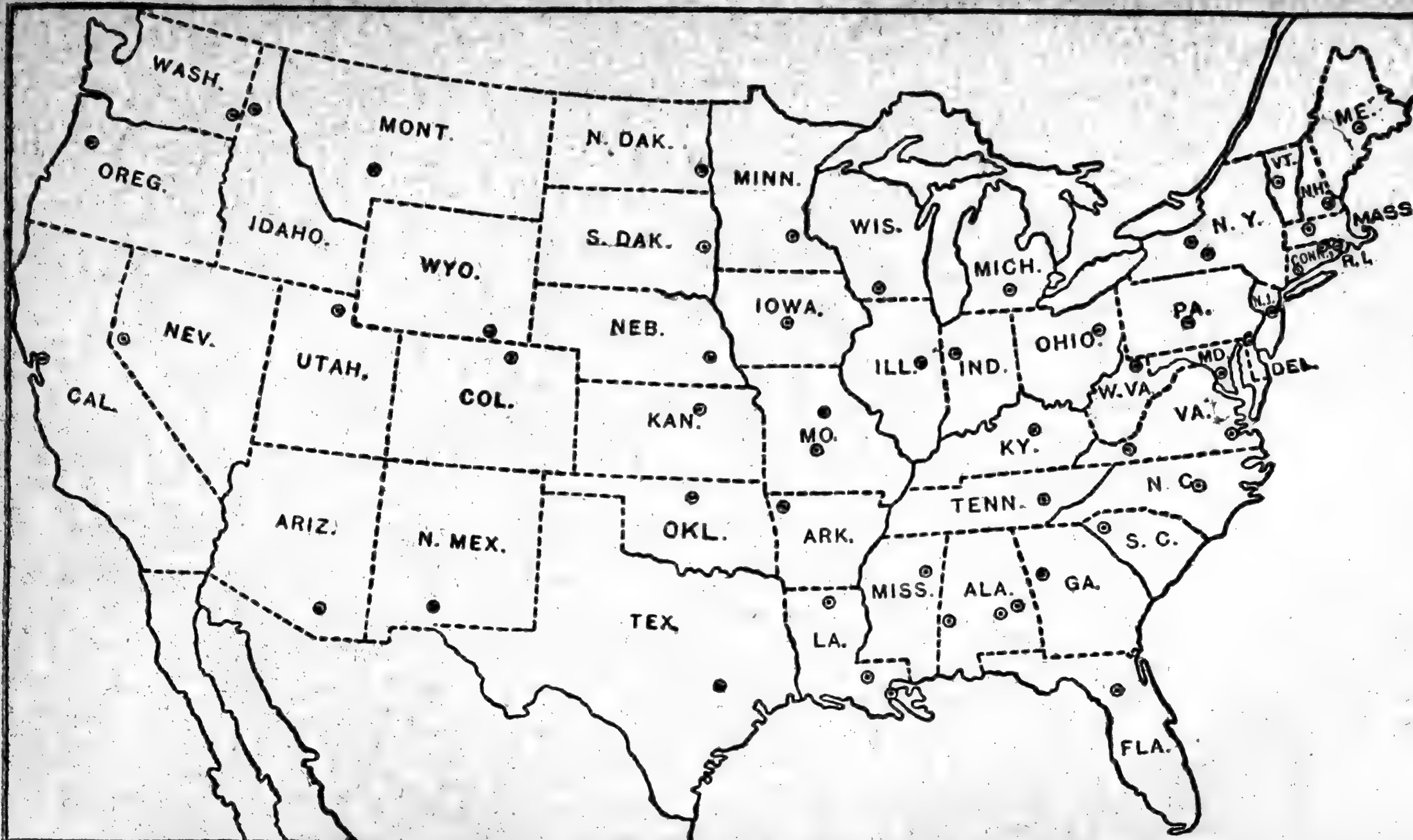

THE AGRICULTURAL EXPERIMENT STATIONS OF THE UNITED STATES.

Issued July 12, 1916.

U. S. DEPARTMENT OF AGRICULTURE

STATES RELATIONS SERVICE

A. C. TRUE, DIRECTOR

Vol. XXXIV — ABSTRACT NUMBER — No. 9

EXPERIMENT STATION RECORD

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[a] Printed in scientific and technical publications outside the Department.

EXPERIMENT STATION RECORD.

VOL. XXXIV. ABSTRACT NUMBER. No. 9.

RECENT WORK IN AGRICULTURAL SCIENCE.

AGRICULTURAL CHEMISTRY—AGROTECHNY.

A handbook of colloid chemistry; the recognition of colloids, the theory of colloids, and their general physico-chemical properties, W. OSTWALD, trans. by M. H. FISCHER, R. E. OESPER, and L. BERMAN (*Philadelphia: P. Blakiston's Son & Co., 1915, pp. XII+278, pl. 1, figs. 60*).—This is the first English edition, translated from the third German edition of this work. It contains methods for general and special colloid analysis and a general theoretical consideration of the subject of colloid chemistry. Many references to original communications are cited in the text.

Industrial and manufacturing chemistry.—I, Organic, G. MARTIN ET AL. (*London: Crosby Lockwood & Son, 1915, 2. ed., rev. and enl., vol. 1, pp. XX+734, pls. 5, figs. 244*).—This is the second edition, revised and enlarged, of the work previously noted (E. S. R., 30, p. 610). The various sections have been brought up to date and new ones added on the hydrogenation of fats, the manufacture of milk sugar, the manufacture of maize and arrowroot starch, the analysis of rubber, and the new synthetic tanning materials. An index list of trade names of the newer synthetic drugs, photographic developers, etc., is appended.

Supplement to Muspratt's encyclopedia of technical chemistry.—Technology of the organic chemical industries, edited by A. BINZ (*Ergänzungswerk zu Muspratt's Encyklopädischem Handbuch der Technischen Chemie.—Chemische Technologie Organischer Industriezweige. Brunswick: F. Vieweg & Son, 1915, vol. 3, 1. half, pp. XIV+515, figs. 51*).—This is the first part of the third supplementary volume to the original work. The general subjects considered are ether, drugs and sera, celluloid, cellulose, the use of cellulose esters for films, disinfection, protein, protein preparations, noninflammable solvents and extraction agents, natural dyestuffs, intermediate products of the coal-tar dye industry, coal-tar dyes, pigments, the determination, testing, and value of coal-tar dyes, and varnishes, siccatives, and lacs.

Supplement to Muspratt's encyclopedia of technical chemistry.—The chemical technology of fermentation and food stuffs, edited by F. HAYDUCK (*Ergänzungswerk zu Muspratt's Encyklopädischem Handbuch der Technischen Chemie.—Chemische Technologie der Gärungsgewerbe, Nahrungs- und Genussmittel. Brunswick: F. Vieweg & Son, 1915, vol. 4, 1. half, pp. XI+516, figs. 331*).—This is the first part of the fourth supplementary volume to the original work. The subjects considered are alcohol and compressed yeast, beer, bread, butyric acid, vinegar, and the tanning industry.

Chemical changes in the souring of milk, L. L. Van Slyke and A. W. Bosworth (*New York State Sta. Tech. Bul. 48 (1916), pp. 12; Jour. Biol. Chem., 24 (1916), No. 3, pp. 191–202*).—The results of the investigation reported demonstrate that about 22 per cent of the lactose of milk is changed by the lactic acid bacteria during the process of souring. Of this amount about 88.5 per cent is converted into lactic acid. The citric acid present in the milk completely disappears, being decomposed into acetic acid and carbon dioxid by *Bacterium lactis aerogenes*. The insoluble inorganic constituents of normal milk are made soluble by the acid resulting from bacterial action. The albumin which in normal milk only partly passes through a porous porcelain filter is so changed in some manner during the souring as to pass completely through such a filter. The calcium caseinate of normal milk is completely converted into free protein and precipitated as such, the calcium forming calcium lactate which is soluble in the serum.

The rate and extent of chemical change under given conditions was also studied. The greatest change of conversion of milk sugar into lactic acid was found to occur between the tenth and the twenty-fourth hour after inoculation. The acidity increased rapidly during the first 24 hours, the rate of increase diminishing after this time. The amount of albumin nitrogen in milk serum was found to increase with the increase of acidity. All of the albumin of the milk appeared in the serum in 14 hours.

The experimental methods used in the investigation were those described in the bulletin previously noted (E. S. R., 32, p. 607).

Chemical changes occurring during the ripening of the wild goose plum, J. S. McHargue (*Jour. Amer. Chem. Soc., 38 (1916), No. 3, pp. 718–722*).—From the results of a study at the Kentucky Experiment Station the author concludes that there is a gradual diminution in the acidity of the fruit during the ripening period, and at the same time an increase in the amount of reducing sugars formed. The greatest increase in total sugars occurs in passing from the unripe to the ripe condition. Saccharose plays a very important part in the ripening of this fruit, which suggests the idea that a fruit is just ripe when it contains the maximum amount of saccharose. This plum contains the enzym invertase, which is apparently most active in the passage of the fruit from the ripe to the overripe stage.

The essential oil of sugi (Cryptomeria japonica) leaves, S. Uchida (*Jour. Amer. Chem. Soc., 38 (1916), No. 3, pp. 687–699*).—The sugi is a coniferous tree indigenous to Japan, and extensively cultivated as a valuable timber. The essential oil of the leaves, obtained by steam distillation, was found to contain the following substances: *d*—α—pinene; dipentene; an alcohol ($C_{10}H_{18}O$, b. p.=212–214°, d_{18}=0.9414, $n_D^{22.8}$=1.4832); cadinene; a sesquiterpene with two double linkings ($C_{15}H_{24}$, b. p.=266–268°, d_{15}=0.9335, $n_D^{22.8}$=1.5041, $[\alpha]_D$=+15.19° in a 6.08 per cent chloroform solution); a sesquiterpene alcohol ($C_{15}H_{26}O$, b. p.=284–286°, $d_{15.5}$=0.9623, $n_D^{22.8}$=1.5048, $[\alpha]_D^{15}$=+16.76° in a 5 per cent chloroform solution); a new diterpene ($C_{20}H_{32}$, b. $p._{700}$=345°, b. $p._{15}$=198, $[\alpha]_D$=−34.22° in a 4.67 per cent chloroform solution) for which the author proposes the name "α-cryptomerene"; a lactone ($C_{20}H_{32}O_2$); caprylic acid in combination with the alcohol; higher fatty acids in a free state; and a blue oil "azulene."

The relative proportion of the above constituents present was also determined.

Essential oil of Formosan hinoki (Chamæcyparis obtusa) wood, S. Uchida (*Jour. Amer. Chem. Soc., 38 (1916), No. 3, pp. 699–702*).—The hinoki tree is extensively grown in Japan and furnishes a timber wood of superior quality. The crude oil obtained by dry distillation of the wood was rectified by steam

distillation and found to consist chiefly of *d*—*a*—pinene and cadinene, with a small amount of oxygenated compounds. The amount of terpenes was about 70 per cent and of sesquiterpenes about 24 per cent.

The thermal values of the fats and oils.—I, The heat of bromination, J. W. Marden (*Jour. Indus. and Engin. Chem., 8 (1916), No. 2, pp. 121–126, figs. 3*).—A special apparatus and method for the determination of the true heat of bromination, and also a new apparatus for the rapid determination of specific heat, are described. Experimental data indicate that the heat of bromination is not directly comparable to the iodin number. The heats of solution of bromin and most oils in carbon tetrachlorid were found to be very small.

The action of bromin on proteins and amino acids, M. Siegfried and H. Reppin (*Hoppe-Seyler's Ztschr. Physiol. Chem., 95 (1915), No. 1, pp. 18–28*).—Experimental data on the absorption of bromin by proteins and amino acids are submitted.

It is indicated that in a mixture of protein cleavage products only amino acids containing a ring complex absorb bromin. Gelatin and edestin absorb more bromin than their cleavage products. The significance of the results obtained is discussed.

On the chemical constitution of the proteins of wheat flour and its relation to baking strength, M. J. Blish (*Jour. Indus. and Engin. Chem., 8 (1916), No. 2, pp. 138–144*).—As the result of his investigation the author concludes that the individual proteins of both strong and weak flours are identical in their chemical constitution as determined by the Van Slyke method (E. S. R., 26, p. 22). The gliadin-glutenin ratio is more constant in flours of different baking qualities than has been indicated by previous investigators, the great variation being in the "soluble proteins." The determination of ammonia nitrogen in the hydrolyzed products of flour, extracts of flour made with various solvents, and crude gluten is proposed to serve as an accurate indication of the amounts of the various proteins present in the flour.

The refractive indices of solutions of certain proteins.—IX, Edestin, C. L. A. Schmidt (*Jour. Biol. Chem., 23 (1915), No. 2, pp. 487–493*).—Experimental data of the refractive indices of varying amounts of edestin, dissolved in various concentrations of solutions of acids, bases, and salts, are submitted.

The solutions were found to follow the law $n-n_1=a\times c$ (E. S. R., 25, p. 709), the average value for a being 0.00174±0.00006. The value for a remained constant, even though the solvent caused hydrolysis of the dissolved protein.

The preparation of glucosamin hydrochlorid from mucoid obtained from the ascitic fluid, A. Oswald (*Hoppe-Seyler's Ztschr. Physiol. Chem., 95 (1915), No. 2–3, pp. 100, 101*).—On boiling the mucoid obtained from the ascitic fluid with 3 per cent hydrochloric acid, filtering, and concentrating the filtrate, the characteristic crystals of glucosamin hydrochlorid were obtained and easily identified.

Enzym investigations.—X, Experiments on the enzymatic synthesis of disaccharids, W. Löb (*Biochem. Ztschr., 72 (1916), No. 5–6, pp. 392–415*).—From the investigation reported the author concludes that the invertase of sugar beets, as well as that of yeast and pancreas, is unable, under the experimental conditions described, to synthesize cane sugar from its corresponding hexoses.

The influence of certain substances on the activity of invertase, E. G. Griffin and J. M. Nelson (*Jour. Amer. Chem. Soc., 38 (1916), No. 3, pp. 722–730*).—Experimental data submitted indicate that the inhibiting effect on enzym activity of certain substances, such as glass beads, serum, and egg albumin, is due to a lowering of the hydrogen ion concentration. The effect of

charcoal was also found to be due to a change in the hydrogen ion concentration. Relatively large amounts of this material, however, were found to absorb invertase from solution. Gelatinous aluminum hydroxid was also found to possess this adsorbing power, but in small amounts it did not interfere with the activity of the enzym.

The occurrence of arginase in the animal organism and its determination by the formol titration procedure, S. EDLBACHER (*Hoppe-Seyler's Ztschr. Physiol. Chem., 95 (1915), No. 2-3, pp. 81-87*).—From his investigation the author concludes that the Sörensen formol titration method is a convenient and reliable procedure for the determination of arginase. Arginase was found in the liver of guinea pigs and rabbits, but was absent from this organ in birds and reptiles. Its presence in the kidneys, thymus, and intestinal mucosa of birds, as reported by Kossel and Dakin,[a] could not be determined by the method followed.

A hydrogen electrode vessel, W. M. CLARK (*Jour. Biol. Chem., 23 (1915), No. 2, pp. 475-486, fig. 1*).—The author describes a form of apparatus devised to meet some special requirements in a study of the hydrogen ion concentrations of bacterial cultures. The accuracy of the results obtained with the apparatus is indicated by experimental data.

Simple sodium lamp for polariscope, G. K. FORESMAN (*Jour. Indus. and Engin. Chem., 8 (1916), No. 2, p. 165*).—The device consists of a piece of fire and acid proof asbestos with a slit of the proper size cut in, and is used in connection with an ordinary Bunsen burner with a wing top. By saturating the edges of the slit with salt solution a flame of great intensity is produced. The asbestos does not affect the quality of the sodium flame.

A large fat extractor, C. L. A. SCHMIDT (*Jour. Indus. and Engin. Chem., 8 (1916), No. 2, p. 165, fig. 1*).—A large apparatus in which several pounds of material may be extracted in a single operation is described and illustrated by a figure. It consists essentially of two parts, a large distilling flask and the extractor proper, which is made of heavy glass. To insure ether-tight seals mercury is used at all the connections. The apparatus may be used for the recovery of the solvent used in the extraction.

Soda lime as an energetic general reagent and its great chemical activity, I. GUARESCHI (*Abs. in Chem. Abs., 10 (1916), No. 1, p. 25*).—A review of the literature of soda lime is given and its history and uses discussed in detail.

Experimental data indicate that soda lime is an excellent absorbent for chlorin, bromin, hydrochloric acid, hydrobromic acid, nitrogen peroxid, and carbonyl chlorid. The freshly prepared reagent absorbs from 80 to 90 cc. of carbon dioxid in 10 minutes. When prepared from calcium oxid and a solution of sodium hydroxid it was found to be a better absorbent for carbon dioxid than solid potassium hydroxid. Carbon monoxid, pyrrol, indol, aldehydes, ethyl bromoacetate, benzyl bromid, chloroacetone, and a number of ethers and nitriles were found to be more or less completely absorbed.

The author concludes that soda lime probably is not a simple mixture but a definite compound, and proposes formulas. With traces of iron, manganese, etc., it is considered superior to the chemically pure material as an absorbent since these substances act as catalysts.

A rapid method of converting scrap platinum into chloroplatinic acid, J. B. and A. TINGLE (*Jour. Soc. Chem. Indus., 35 (1916), No. 2, p. 77*).—A method in which the platinum is alloyed with zinc by fusion under a layer of borax or other flux is described. The metallic mass which results from the fusion is treated with dilute commercial hydrochloric acid. The zinc dissolves rapidly

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[a] Hoppe-Seyler's Ztschr. Physiol. Chem., 42 (1904), No. 3, p. 184.

and leaves behind a black powder resembling platinum black. This is dissolved in aqua regia, the resulting solution evaporated to dryness, and the residue redissolved in very dilute hydrochloric acid. From this solution the platinum is separated either by precipitating the metal with zinc or by precipitating with hydrogen sulphid, filtering, washing, and igniting the resulting sulphid. The platinum thus obtained is readily soluble in aqua regia, and easily converted into chloroplatinic acid in the usual manner.

A possible source of error in colorimeter observations, J. H. LONG (*Jour. Amer. Chem. Soc., 38 (1916), No. 3, pp. 716–718*).—The author reports certain discrepancies in colorimeter observations which resulted from using an instrument which had stood through a hot summer in a room the temperature of which often reached 33° C. (91.4° F.). At this temperature the wax by which the prisms are fastened in their brass sockets becomes soft enough to permit the slow displacement of the glass. Care should therefore be exercised to keep instruments away from the vicinity of steam radiators and from places which are likely to become very warm in summer.

An evaluation of the methods for the determination of phosphoric acids soluble in citric acid and that found in dephosphorization slags (Thomas slag), O. SICHMANN (*Zhur. Opytn. Agron., 16 (1915), No. 3, pp. 169–212*).—As the result of a critical comparison the author has found very little difference between the molybdic method, the methods of Lorenz (E. S. R., 13, p. 14), Popp (E. S. R., 29, p. 410), Darmstadt, and Naumann (E. S. R., 14, p. 940), and the hydrochloric acid method. The Lorenz method gave the lowest results. For convenience and rapidity the methods of Popp and Lorenz are recommended, the latter being the simpler.

Easily extractable phosphorus and phosphorus nutrition, I. JAKOUCHKINE (*Zhur. Opytn. Agron., 16 (1915), No. 2, pp. 118–139*).—The author has shown that for material poor in fat, such as stems or stalks, the alcohol and ether extraction does not cause an appreciable decrease of phosphorus pentoxid in the acid extract. Direct precipitation in citric acid was used in separating the mineral phosphate from the phytin. More exact results may be obtained by using this method in combination with that of Iwanoff by first precipitating with magnesia mixture in the presence of citric acid, and, after dissolving in nitric acid, reprecipitating by Neumann's method.

The amount of phytin in the grain is apparently dependent on the condition of the soil. The fertility of the soil is indicated by the mineral-phosphate content of the straw, and when the content is less than from 0.07 to 0.1 per cent a phosphate fertilizer is deemed necessary, while a mineral-phosphate content greater than 0.15 per cent shows that the soil is sufficiently rich in phosphorus.

The decomposition of tetrathionates in alkaline solution as a source of error in certain iodin titrations, R. M. CHAPIN (*Jour. Amer. Chem. Soc., 38 (1916), No. 3, pp. 625, 626*).—The experimental data reported indicate that "tetrathionates are notably sensitive to even low concentrations of hydroxyl ions, though only slightly affected by sodium bicarbonate, and still less by sodium bicarbonate in presence of carbonic acid. It therefore follows that acid solutions containing tetrathionates, if to be later titrated with iodin or subjected to any treatment involving assumption that the tetrathionate present has remained unaffected, should never be neutralized by any substance of distinctly alkaline properties." Sodium carbonate, however, may be used within reasonable limits of error, provided the solution is not subjected to an elevated temperature for any length of time. Sodium sulphite is recommended as a discharging agent for iodin in place of sodium thiosulphate.

Report of the session of the International Commission for Chemical Soil Analysis; Munich, April 23 and 24, 1914 (*Internat. Mitt. Bodenk., 5 (1915), Nos. 1, pp. 25–52; 2, pp. 127–153*).—This is an account of the proceedings of the commission, including discussions of chemical methods for soil analysis.

The application of potassium permanganate for the determination of humus in soils, P. Grigorieff (*Zhur. Opytn. Agron., 16 (1915), No. 3, pp. 217–222*).—The probable nature of the oxidation of the humus in soil by potassium permanganate is considered. The results obtained by the oxidation method do not agree with those obtained by Gustavsohn's method, the former method yielding too high results. For this reason it is concluded that the oxidation method, although simple and rapid, is not to be preferred to the combustion method.

On the distribution and composition of the humus of the loess soils of the transition region, M. J. Blish (*Univ. [Nebr.] Studies, 14 (1914), No. 2, pp. 111–144*).—From a long series of experiments on Nebraska soils the author concludes that the Rather method (E. S. R., 26, p. 406) for humus determinations is the most practical of all gravimetric methods tried. For the determination of humus nitrogen the Alway-Bishop procedure was found to be the most satisfactory, both in point of accuracy and economy of time.

Soil color may be associated fairly closely with humus content when the soils under inspection are from the same locality. A reliable comparison, however, can not be made with soils from different localities on account of the presence of substances other than humus, such as lime and iron. The photometric determination was not found to give satisfactory results with soils containing less than 0.1 per cent of humus. Great variation in the humus content of the soils was found with respect to both locality and depth from which the samples were taken.

A comparison of methods for the determination of soil phosphorus, W. O. Robinson (*Jour. Indus. and Engin. Chem., 8 (1916), No. 2, pp. 148–151*).—The results of the author's investigation indicate that accurate determinations can be obtained by the fusion, Washington, and Fischer methods of treating the soil for phosphorus determinations. Vanadium interferes with the volumetric phosphorus determinations in soils, but the difficulty was overcome by reducing the vanadium with ferrous sulphate and precipitating the phosphorus at a low temperature by agitation. Tungsten and titanium were not found to interfere with the phosphorus determinations by the gravimetric method when proper precautions for complete precipitation were exercised.

A limestone tester, C. G. Hopkins (*Illinois Sta. Circ. 185 (1916), pp. 2–12, figs. 2*).—This circular describes in detail a simple apparatus and method for the determination of calcium carbonate in limestones used for agricultural purposes, similar to and based on the same principle as the "calcimeter" previously noted (E. S. R., 34, p. 503).

The final result can not be ascertained by direct reading but involves a simple calculation. Tables of the weight of carbon dioxid in milligrams per cubic centimeter at various temperatures and pressures are included.

The apparatus may also be used for determining the limestone content of soils.

Some new methods for the analysis of lime-sulphur solutions, R. M. Chapin (*Jour. Indus. and Engin. Chem., 8 (1916), No. 2, pp. 151–156*).—New methods based on definite reactions are described in detail. Some of the procedures are applicable to polluted dipping baths through which sheep and cattle have passed.

On the detection and determination of halogens in organic compounds, I. Drogin and M. A. Rosanoff (*Jour. Amer. Chem. Soc., 38 (1916), No. 3, pp.

711–716).—An improvement of the method described by Stepanoff[a] and modified by others is outlined in detail.

The method consists in dissolving the halogen compound in 98 per cent alcohol, adding an excess of sodium and, after sufficient heating, diluting the mixture with water. The alcohol is then distilled off, the solution acidified with nitric acid, and the free halogen acid, thus produced, titrated according to Volhard's method. Experimental data submitted indicate the accuracy of the method. The qualitative procedure was found to yield a decided positive test in certain cases where the Beilstein test gave a doubtful result.

A method for the estimation of chlorids in cheese, Elfreida C. V. Cornish and J. Golding (*Analyst, 40 (1915), No. 470, pp. 197–203, fig. 1; abs. in Ztschr. Angew. Chem., 29 (1916), No. 2, Referatenteil, p. 4*).—A method claimed to be more accurate and rapid than the incineration or water-extraction method is described.

The sample is treated in a Kjeldahl flask with concentrated sulphuric acid and gently heated. By means of a specially arranged apparatus the hydrochloric acid formed by the action of the sulphuric acid on the chlorids present is aspirated into standard acid silver nitrate and precipitated as silver chlorid. When the reaction is complete the silver chlorid is filtered, washed free of nitrates, the washings added to the filtrate, and the excess of silver nitrate in the filtrate determined according to Volhard's method. Experimental data, obtained from different samples of normal cheese and others showing a brown discoloration are submitted.

The cheese residue remaining in the flask after the distillation of the hydrochloric acid may be used for the estimation of nitrogen in the solid cheese, by Kjeldahl's method.

The determination of acidity in potatoes, J. F. Hoffmann and F. Preckel (*Landw. Vers. Stat., 87 (1915), No. 2–3, pp. 237–239*).—The following procedure is recommended by the authors:

Fifty cc. of the pressed juice is measured into a 250 cc. flask, and 95 per cent alcohol added to the mark. The mixture is allowed to set for about one hour with occasional shaking and then filtered. For the titration 100 cc. of the filtrate is diluted with an equal volume of water and 1 cc. of rosolic acid added. The liquid thus contains about 80 cc. of alcohol and 120 cc. of water. A comparison solution is prepared in a similar manner with 80 cc. of alcohol and 120 cc. of water and titrated to a definite color change. The potato sample is titrated to the same shale and the reading of the comparison solution subtracted from that of the potato sample. The liquids should be well shaken before titrating in order to remove as much as possible of the carbon dioxid, which influences the color change.

The analysis of maple products.—V, Miscellaneous observations on maple sirup incidental to a search for new methods of detecting adulteration, J. F. Snell (*Jour. Indus. and Engin. Chem., 8 (1916), No. 2, pp. 144–148*).—Certain observations made while working on new methods for the detection of adulteration are recorded. A complete ash analysis of a composite of about 60 genuine sirups indicated the presence of more chlorin and less phosphoric acid than the analyses previously recorded.

See also previous notes (E. S. R., 32, p. 808; 33, pp. 15, 208).

The determination of small amounts of sugar in urine, S. Nagasaki (*Hoppe-Seyler's Ztschr. Physiol. Chem., 95 (1915), No. 2–3, pp. 61–77*).—For determining small amounts of sugar in urine the author has devised a method as follows:

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[a] Ber. Deut. Chem. Gesell., 39 (1906), No. 16, pp. 4056, 4057.

The sample is first titrated with Benedict's copper solution (E. S. R., 25, p. 15). Another sample is then inoculated with the yeast *Torula monosa* and allowed to ferment for 24 hours at 30° C. After the fermentation the sample is again titrated with Benedict's solution and the amount of glucose calculated from the difference in the two titrations. By boiling the fermented urine with citric acid and repeating the fermentation and titrations as before, the isomaltose, calculated as glucose, can be easily determined. Samples in which spontaneous fermentation has started do not give reliable results.

The method is deemed of value in determining the slight influence of a diet in cases of glycosuria, and in making a diagnosis of doubtful cases of diabetes. The average glucose content of 174 samples of normal urine was found to be 0.012 per cent (maximum 0.033, minimum 0.002 per cent), and the average percentage of isomaltose in 84 samples was found to be 0.012 per cent (maximum 0.023, minimum 0.003 per cent).

The determination of amino acids in urine, I. Bang (*Biochem. Ztschr., 72 (1915), No. 1–2, pp. 101–103*).—To obviate the inconvenience of titrating a colored solution in the formol titration method for the determination of amino-acid nitrogen the author recommends that the solution be decolorized with blood charcoal in the presence of 20 per cent alcohol. No amino-acid nitrogen is lost by this procedure.

New indican reaction, A. Jolles (*Hoppe-Seyler's Ztschr. Physiol. Chem., 95 (1915), No. 1, pp. 29–33*).—The following procedure is recommended as a qualitative test for indican:

Ten cc. of urine is mixed with 1 cc. of a 5 per cent alcoholic solution of α-naphthol and 10 cc. concentrated hydrochloric acid (containing 5 gm. ferric chlorid per liter). The mixture is thoroughly shaken and allowed to set for 15 minutes, after which the coloring matter is extracted with 5 cc. of chloroform. The color of the extract will vary from violet to a dark blue, depending on the amount of indican present. The reaction is sensitive to 0.003 mg. indican in 10 cc. of liquid, but is not applicable to quantitative colorimetric determinations.

The nephelometric determination of small amounts of essential oils, A. G. Woodman, R. T. Gookin, and L. J. Heath (*Jour. Indus. and Engin. Chem., 8 (1916), No. 2, pp. 128–131, figs. 2*).—A procedure based on the formation of an emulsion on adding water to an alcoholic solution of an essential oil, using the Kober nephelometer previously noted (E. S. R., 31, p. 114), is described. Great accuracy is said to be possible with the method in concentrations up to 1 per cent and, by suitable dilution with alcohol, in higher concentrations. In applying the method to cordials the percentage of alcohol and sugar influences the results to such an extent that it is necessary to use a standard containing approximately the same amounts of these materials. If the cordials are deeply colored the alcohol may be distilled off and the distillate compared with a standard extract.

The utilization of cherry by-products, F. Rabak (*U. S. Dept. Agr. Bul. 350 (1916), pp. 24*).—As a result of the investigation the author obtained from the pits of red sour cherries a fixed oil, the physical and chemical properties of which were found to be very similar to those of the commercial oil of almonds. It is indicated that this oil should find application along pharmaceutical and therapeutical lines, as a condimental oil, or in the soap-making industry. The volatile oil produced from the press cake is practically identical with the oil of bitter almonds, and would thus find the same application. Analysis of the meal, which is the final residue, showed 1.06 per cent of moisture, 30.87 per cent of protein, 13.1 per cent of ether extract, 42.13 per cent of nitrogen-free

extract, 8.9 per cent of crude fiber, and 3.94 per cent of ash. From the juice alcohol, sirup, and jelly have been successfully prepared.

SOILS—FERTILIZERS.

Soil survey of Lee County, Iowa, L. V. Davis and M. E. Sar (*U. S. Dept. Agr., Advance Sheets Field Operations Bur. Soils, 1914, pp. 36, pls. 2, fig. 1, map 1*).—This survey, made in cooperation with the Iowa Experiment Station and issued March 10, 1916, deals with the soils of an area of 327,040 acres in southeastern Iowa.

"The county comprises two main physiographic divisions. The upland plateau, with level to rolling topography, constitutes one division, and the alluvial river terraces and first bottoms the other. The former occupies about six-sevenths of the total area of the county." The soils of the county are of loessial, glacial, residual, and alluvial origin. Nineteen soil types of nine series are mapped, of which the Grundy silt loam, the Lindley loam, the Putnam silt loam, and the Memphis silt loam cover respectively 27.5, 23.7, 11.4, and 10 per cent of the area.

Soil survey of Cherokee County, Kansas, P. O. Wood and R. I. Throckmorton (*Kansas Sta. Bul. 207 (1915), pp. 46, pl. 1*).—This survey, made in cooperation with the Bureau of Soils of this Department and noted in the Field Operations of that Bureau for 1912 (E. S. R., 34, p. 322), deals with the general characteristics, mechanical and chemical composition, and crop adaptabilities of the soils of an area of 374,400 acres in southeastern Kansas, consisting mainly of residual prairie.

The soils are residual upland soils and alluvial bottom soils. Including meadow, 22 soil types of 13 series are mapped, of which the Bates silt loam and the Cherokee silt loam cover 24.5 and 20 per cent of the area, respectively. Chemical analyses of samples of the types are reported, the results of which are taken to indicate that these soils are relatively deficient in nitrogen, phosphorus, potassium, and lime, and high in organic matter. The majority of the soils are acid.

A fertilizer test with wheat is included.

Soil survey of Reno County, Kansas, W. T. Carter, Jr., et al. (*Kansas Sta. Bul. 208 (1915), pp. 48, pl. 1*).—This survey, made in cooperation with the Bureau of Soils of this Department and noted in the Field Operations of that Bureau for 1911 (E. S. R., 31, p. 513), deals with the general characteristics, mechanical and chemical properties, and crop adaptabilities of the soils of an area of 812,000 acres in south-central Kansas, the general topography of which is that of a rolling plain intersected by three relatively narrow valleys.

The soils of the area are upland and bottom soils and are formed (1) from shales and sandstones, (2) from unconsolidated water-laid deposits, (3) from a mixture of the above two groups, and (4) from wind-laid deposits. Including meadow and dune sand, 31 soil types of 10 series are recognized, of which the Pratt loam and fine sandy loam and the Albion sandy loam cover 16.6, 15.1, and 11.1 per cent of the area, respectively. Chemical analyses of representative samples of each type made at the station are reported, the results of which show that the nitrogen content averages 0.106 per cent for the surface soil, 0.076 per cent for the subsurface soil, and 0.045 per cent for the subsoil, and the phosphorus content averages 0.034 per cent for the surface and subsurface soil and 0.031 per cent for the subsoil. The potash and lime contents are considered to be relatively high, most of the soils containing more than 2 per cent potassium. The average calcium content for the county was 0.88 per cent in the soil, 1.47 in the subsurface soil, and 1.73 in the subsoil.

Soil survey of Union County, North Carolina, B. B. DERRICK and S. O. PERKINS (*U. S. Dept. Agr., Advance Sheets Field Operations Bur. Soils, 1914, pp. 38, fig. 1, map 1*).—This survey, made in cooperation with the North Carolina Department of Agriculture and issued March 4, 1916, deals with the soils of an area of 403,200 acres in southern North Carolina.

"The general surface features of Union County consist of broad, gently rolling interstream areas, which become more rolling, broken, and hilly as the larger streams are approached. The central, eastern, and northern portions of the county slope to the northeast and are well drained by the Rocky River and its tributaries, while the remainder inclines toward the southwest, being drained by tributaries of the Catawba River." The county lies wholly within the Piedmont Plateau province and the soils are of residual origin. Sixteen soil types of 8 series are mapped, of which the Alamance silt loam and gravelly silt loam cover 24.7 and 16.9 per cent of the area, respectively, and the Georgeville gravelly silt loam and silt loam 15.5 and 13.9 per cent, respectively.

Soil survey of Portage County, Ohio, C. N. MOONEY, H. G. LEWIS, A. F. HEAD, and C. W. SHIFFLER (*U. S. Dept. Agr., Advance Sheets Field Operations Bur. Soils, 1914, pp. 44, fig. 1, map 1*).—This survey, made in cooperation with the Ohio Agricultural Experiment Station and issued March 4, 1916, deals with the soils of an area of 333,440 acres in northeastern Ohio, the topography of which ranges from flat or slightly undulating to rolling and hilly. The soils are of glacial and alluvial origin. Including muck, 18 soil types of 10 series are mapped, of which the Volusia clay loam, loam, and silty clay loam cover 27.4, 25.1, and 10.1 per cent of the area, respectively, and the Wooster loam 18.1 per cent.

Analyses of typical soils, J. W. AMES (*Mo. Bul. Ohio Sta., 1 (1916), No. 3, pp. 73–76*).—Results selected from a number of analyses of representative soils from various localities in Ohio are reported in the following table for the purpose of indicating the variations in amounts of fertility constituents that may exist in different classes of soil:

Fertility constituents in different classes of soil, per acre.

Type of soil.	Depth.	Nitrogen.	Phosphorus.	Potassium.	Calcium.	Magnesium.
	Inches.	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*	*Pounds.*
Sand	0- 7	1,000	892	20,000	9,038	4,050
Sandy loam	0- 7	2,390	782	28,772	12,302	5,128
Do	7-15	590	282	30,636	11,942	5,526
Silt loam	0- 7	2,096	870	29,092	4,758	5,684
Do	7-15	1,054	608	31,278	3,996	7,750
Clay loam	0- 7	2,926	766	31,331	7,560	6,271
Do	7-15	1,152	388	35,088	7,092	9,800
Clay	0- 7	2,170	690	42,384	5,618	12,000
Do	7-15	910	428	44,800	3,726	15,000
Black clay loam	0- 7	4,900	1,456	41,806	15,804	14,154
Do	7-15	2,100	788	49,872	14,180	17,860
Black clay	0- 7	7,440	1,958	46,726	18,856	14,348
Do	7-15	3,800	1,446	52,600	16,650	15,772
Peat	....	27,860	1,710	3,370	2,010	2,420

Geo-agronomic study of the farm lands of the Royal Institute of Experimental Agriculture in Perugia, B. MARCARELLI (*Staz. Sper. Agr. Ital., 48 (1915), No. 4, pp. 233–271, pls. 4*).—This is a detailed description of the topography, geology, origin, and characteristics of the soils and of the meteorological and agricultural conditions of the farm lands of the institute and includes mechanical and chemical analyses of the soils.

Soils study according to the geological-agronomic survey, with especial reference to the soils types of the lower Rhine districts, E. ZIMMERMANN (*Fühling's Landw. Ztg., 64 (1915), No. 13–14, pp. 329–347*).—This is a general discussion of the methods, results, and advantages of this kind of soil survey as applied to the lower Rhine districts.

Successful soil-sampling tools, A. M. SHAW (*Engin. News, 74 (1915), No. 26, p. 1228, fig. 1*).—A soil-sampling outfit consisting of an auger and pipe extension for taking deep samples is described.

Recent brown soil and humus formation in Java and the Malay Peninsula, together with remarks on climatic weathering, R. LANG (*Centbl. Min., Geol. u. Paläontol., 1914, Nos. 17, pp. 513–518; 18, pp. 545–551; abs. in Zentbl. Agr. Chem., 44 (1915), No. 4–5, pp. 148–150*).—The author reports the results of observations on the occurrence and origin of the so-called brown soils and humus soil of Java and the Malay Peninsula and the influence of climatic factors on their formation.

It is concluded that the main factor in the formation of both these soils is an extraordinarily heavy rainfall. Brown soils are formed when the waters of a tropical region are so impregnated with mineral salts as to effect an adsorptive saturation of the soil humus substances with which they come in contact.

Raw humus is formed where the waters of tropical regions do not contain sufficient mineral salts to effect an adsorptive saturation of humus substances. It is further concluded that dampness and coolness favor humus formation, while heat and dryness retard it.

Determination of amino acids and nitrates in soils, R. S. POTTER and R. S. SNYDER (*Iowa Sta. Research Bul. 24 (1915), pp. 327–352, figs. 3*).—This bulletin briefly reviews the work of others bearing on the subject and reports the details of the experiments noted below and of experiments previously noted from another source (E. S. R., 34, p. 112).

The amino acid nitrogen of soil, R. S. POTTER and R. S. SNYDER (*Jour. Indus. and Engin. Chem., 7 (1915), No. 12, pp. 1049–1053, figs. 3*).—Laboratory and pot experiments are reported in which it was found that by use of the Kober copper method of determining amino acids (E. S. R., 31, p. 211) no amino acid nitrogen could be detected in the dilute acid extract of soils. Upon adding small quantities of amino acid to a soil and extracting with dilute acids no amino acid was found. "Upon adding small quantities of amino acids to a soil and extracting with dilute alkali, practically the entire amount added was recovered. There was found to be no difference in the quantity of amino acid nitrogen extracted by dilute alkali in one, two, four, and six hours."

From the pot experiments it is concluded that "there is no tendency for amino acid to accumulate . . . in a limed and unlimed acid soil, in a heavily manured and limed, and a heavily manured unlimed acid soil. The amino acid nitrogen was present in the soil in less amounts than the ammonia nitrogen, but in a general way it fluctuates with the ammonia nitrogen. The soils with the higher amounts of manure show a decided decrease in the amount of nitrate nitrogen at first, but after from four to six weeks there is a decided increase."

The origin of the "niter spots" in certain western soils, W. G. SACKETT and R. M. ISHAM (*Science, n. ser., 42 (1915), No. 1083, pp. 452, 453*).—The authors disagree with the theory of Stewart and Peterson (E. S. R., 33, p. 121) with reference to the cause of the brown coloration of the so-called niter spots in some western soils, and adhere to the theory of pigmentation of *Azotobacter*

chroococcum as the cause of the brown coloration of the spots (E. S. R., 25, p. 815).

The origin of the "niter spots" in certain western soils, R. STEWART and W. PETERSON (*Science, n. ser., 43 (1916), No. 1097, pp. 20–24*).—This is a reply to the above, in which the authors reiterate their original theory regarding the origin of the brown niter spots (E. S. R., 33, p. 121). They conclude "that the nonsymbiotic bacteria are not responsible for the production of the nitrates noted in the niter spots of the affected soils of the arid West and their presence there is only incidental and of no more economic importance than their more abundant occurrence in other normal niter-free soils of the arid regions. The nitrates present in the niter spots are the direct result of the leaching and concentrating action of the ground water upon the nitrates preexisting in the country rock adjacent to or underneath the soil of the affected area. . . . The color is due to the solvent and decomposing action of the nitrates upon the old organic matter or humus in the soil." Experimental data are cited in support of the argument.

The variation of the fertility and productivity of the soil under the influence of natural conditions and dry air storage, K. GEDROÏTS (*Trudy Selsk. Khoz. Khim. Lab. St. Peterb., 8 (1914), pp. 144–199; abs. in Selsk. Khoz. i Lies̄ov., 245 (1914), Aug., pp. 630–633; Zhur. Opytn. Agron. (Russ. Jour. Expt. Landw.), 15 (1914), No. 4, pp. 307, 308; Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases, 6 (1915), No. 1, pp. 37–39*).—Pot experiments with oats and flax on soils stored in dry air from one to six years following 1903 are reported, in which no fertilization, complete fertilization, complete fertilization without nitrogen, and complete fertilization without phosphoric acid were practiced.

A gradual increase in the oat crop without fertilizer with length of storage was observed, except in the fifth year of storage. "The same effect also occurred in the pots without nitrogen and without phosphate. With the complete fertilizer the greatest yield was obtained in the first year; there was then a considerable decrease in the second year, followed by a gradual increase, though the yield of the first year was never reached. In the case of flax with a complete fertilizer the harvest increased regularly during the four years after the first year, then remained almost constant. With the other series the changes corresponded to those of the oats."

As a check on the above experiments a series was conducted in which soils collected in various years were all tested in the same year (1908). "These experiments and many others carried out during a period of years show that the yield is always in direct relation with the length of storage of the soil. Chemical analysis shows a slight increase in the percentage of phosphoric acid soluble in 2 per cent citric acid and in acetic acid. In 1904 the citric acid soluble phosphoric acid was 0.0078 per cent and in 1909 the same soil gave 0.0096 per cent. The percentage of phosphoric acid in the oats and flax was also increased with the duration of storage of the soil. . . . Chemical analysis showed similar results with respect to nitrogen. . . .

"These results lead to the conclusion that storing the soil in dry air increases its productivity in proportion to the period of storage, and also increases in a corresponding degree the percentage of phosphoric acid and nitrogen in the crop."

The development of a dynamic theory of soil fertility, F. K. CAMERON (*Jour. Franklin Inst., 181 (1916), No. 1, pp. 27–49, figs. 2*).—The author reviews some of the more important features of the existing knowledge of soil fertility and points out that soil management involves the consideration of

all the natural factors affecting the same, singly and in total, and that each of these factors is in a continual process of change. "The problems of soil management are, therefore, essentially dynamic. . . . The properties of the soil are not merely the sum of the properties of the components, but the summation of these properties as they mutually affect and modify each other."

It must therefore be recognized "that the problems of soil fertility are no longer problems merely of soil composition or merely of a supply of plant food. The great fundamental questions now are: What are the processes, physical, chemical, and biological, taking place continually in the soil? What are their magnitudes and what are the rates of change? How do they affect one another? What are the differences between individual soils that are the expression of the resultants of these interdependent processes?"

The difference between rye and wheat soils, A. STUTZER and W. HAUPT (*Fühling's Landw. Ztg., 64 (1915), No. 13–14, pp. 347–352*).—In examinations of eight wheat soils and four rye soils no marked difference in chemical composition was observed, but mechanical analyses showed that the clay content and the content of fine particles in general were greater for the wheat than for the rye soils. These results are taken to indicate that, other conditions being approximately equal, mechanical analysis will probably in general serve as a basis for judgment as to whether a soil is better adapted to wheat or rye.

Studies of the influence of soil condition on the bacterial life and the transformation of matter in soils, H. R. CHRISTENSEN (*Centbl. Bakt.* [*etc.*], *2. Abt., 43 (1915), No. 1–7, pp. 1–166, pls. 2, figs. 21; Ber. Stat. Forsögs Virks. Plantekult., 81 (1914), pp. 321–552, pls. 2, figs. 21; abs. in Chem. Zentbl., 1915, I, No. 13, pp. 700, 701; Internat. Inst. Agr.* [*Rome*], *Mo. Bul. Agr. Intel. and Plant Diseases, 6 (1915), No. 7, pp. 923, 924; Zentbl. Agr. Chem., 44 (1915), No. 7, pp. 290–296*).—A series of detailed investigations along lines similar to those previously noted (E. S. R., 18, p. 720), using Remy's method of cultures in inoculated solutions of mannite and a number of different soils for inoculation, are reported. The purpose was to study the relations between soil conditions and the activities of Azotobacter, the power of soils to ferment mannite and decompose peptone and cellulose, and the nitrifying power of soil.

It was found that the development of Azotobacter in mannite solution depended upon the presence of basic matter, either in the solution or in the soil used for inoculation. In no case was a growth of Azotobacter obtained with a base-free medium, but when the carbonates of calcium or magnesium were added a marked growth of Azotobacter was obtained in the solutions inoculated with raw cultures of Azotobacter. This is taken to indicate that the growth of Azotobacter in an inoculated lime-free mannite solution may indicate the presence of basic matter in the soil and that the method may serve to indicate the need of a soil for lime.

Experiments using mannite solutions with and without lime showed that the occurrence of Azotobacter is not so general as is commonly thought and that a sure indication of the basicity of a soil or of its need for lime can not be obtained by use of a lime-free mannite solution without inoculation with Azotobacter. It is concluded that the use of inoculated and uninoculated cultures will determine whether the absence of Azotobacter is due to the chemical or biological conditions of a soil, and that the occurrence and distribution of Azotobacter in soil are governed by its reaction and basicity. It is further concluded that Azotobacter practically never exist in acid soils and only seldom in neutral soils, and that the presence of basic lime and magnesia compounds is especially favorable for their growth.

Further experiments showed that a growth of Azotobacter on the addition of calcium sulphate to cultures of soils which had previously showed no

growth is an indication of the probable presence of alkaline carbonates in the soils. A marked development of Azotobacter in a mannite solution containing no phosphoric acid is taken to indicate that the soil used is probably not deficient in phosphoric acid.

It was found further that soils producing no fermentation of mannite in a lime-free mannite solution were very deficient in lime. This is taken to indicate that the degree of fermentation produced under such conditions serves as a measure of the amount of lime present in a form available to mannite-fermenting bacteria.

The addition of phosphoric acid to a peptone solution inoculated with decomposed peptone markedly aided the decomposition of the solution. The addition of carbon compounds did not accelerate decomposition, but humus and ferric phosphate did. Studies of the decomposition of peptone by soils, using inoculated and uninoculated cultures, showed that lowland moor peat soil possessed a much greater power for decomposing peptone than upland moor peat soil. The upland moor peat contained substances which inhibited peptone decomposition, but which were rendered inactive by adding calcium carbonate. Additions of calcium carbonate and phosphoric acid and of phosphoric acid alone to acid lowland moor peat favored peptone decomposition. Inoculation of the lowland moor peat cultures had no effect, but inoculation of the upland moor peat cultures markedly favored the decomposition of peptone.

In cultivated mineral soils peptone decomposition varied greatly. The phosphoric acid content of the soils especially influenced the degree of decomposition. All the soils tested appeared to contain sufficient humus for maximum peptone decomposition. With reference to the effect of inoculation of cultures with decomposed peptone the mineral soils were of two groups, namely, (1) those in which inoculation had little or no effect on peptone decomposition and which were in all cases basic, and (2) those in which inoculation markedly favored peptone decomposition and which were not basic. It is concluded that a soil of low peptone decomposing power forms an unfavorable medium for crop growth.

The decomposition of cellulose was usually found to be very small in humus soils. With upland and lowland moor soils practically the same differences were observed in cellulose decomposition as in peptone decomposition, except that the influence of chemical factors was more marked. Next to the content of basic lime and phosphoric acid, the availability of the organic nitrogen in peat was the factor controlling the decomposition of cellulose. In mineral soils it was found in all cases that the chemical condition of the soil mainly controlled cellulose decomposition, basic lime and phosphoric acid being the controlling factors.

In both humus and mineral soils nitrification was found to be governed mainly by their biological condition.

A list of references to literature bearing on the subject is appended.

On the presence of Azotobacter in Danish woods and on the value of Azotobacter cultures for the determination of the lime requirements in woodland, F. WEIS and C. H. BORNEBUSCH (*Forstl. Forsögsv. Danmark, 4 (1914), No. 4, pp. 319–337; abs. in Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases, 6 (1915), No. 4, pp. 546–548*).—Experiments using Beijerinck's nutritive medium to determine the Azotobacter content of soils from 64 different localities in Danish forests are reported.

Azotobacter was found in only two of the soils, both of which showed marked alkalinity. In culture experiments in which the soil in question was substituted for calcium carbonate in Beijerinck's solution positive results were obtained in 32 out of 54 cases. "In several cases the dry leaves fallen to the

ground were examined for Azotobacter, but always with negative results. In the cases in which it was looked for in arable soils in the immediate vicinity of woods whose soil did not contain any species of Azotobacter its presence was easily demonstrated, but the species was always *A. chroococcum*."

The following general conclusions are drawn: "Azotobacter is only exceptionally present in Danish forest soils. In some localities in which the soil contains much calcium carbonate *A. beijerinckii* and *A. vitreum* are present. Consequently, for the supply of nitrogen to the forest soils of Denmark some other micro-organisms, probably lower fungi, must be of importance. . . . The culture of Azotobacter in Beijerinck's nutritive solution in which the lime is replaced by 5 gm. of the soil to be studied is a rapid and easy way of showing if a woodland to be regenerated requires lime or not since the calcium compounds that favor the development of Azotobacter in such cultures seem to be the same which facilitate the development of those organisms which lead to the production and conservation of a good mold and favor the development of forest trees, especially of beeches."

A report along similar lines by Christensen is noted above.

The nonsymbiotic nitrogen-fixing soil bacteria and their importance in natural economy, M. DÜGGELI (*Naturw. Wchnschr., 30* (*1915*), *No. 42, pp. 657–664*).—The author discusses the physiology and activity of the nonsymbiotic nitrogen-fixing soil bacteria, with special reference to their relation to soil fertility.

The fixation of potash by soil bacteria, S. KYROPOULOS (*Ztschr. Gärungsphysiol., 5* (*1915*), *No. 3, pp. 161–166; abs. in Internat. Inst. Agr.* [*Rome*], *Mo. Bul. Agr. Intel. and Plant Diseases, 6* (*1915*), *No. 10, pp. 1306, 1307*).—Studies of the potash-fixing powers of soil bacteria in soil and solution cultures, using cane sugar as the nutritive medium in soil and the Beijerinck nutritive solution, showed, with different potash additions, no analytical proof of the assimilation of any considerable amounts of potash by bacteria.

The antizymotic action of a harmful soil constituent: Salicylic aldehyde and mannite, J. J. SKINNER (*Plant World, 18* (*1915*), *No. 6, pp. 162–167*).—Experiments with wheat in distilled water and in nutrient solution cultures to determine the influence on the crop growth of mannite alone and in combination with salicylic aldehyde are reported. Mannite was used alone in concentrations varying from 10 to 200 parts per million in distilled water, and in a concentration of 100 parts per million in nutrient solution. In the distilled water cultures "growth in some of the mannite concentrations was about equal to that in pure distilled water. Some of the cultures produced larger growth and others made less growth than in distilled water." It was further found that "the mannite in the nutrient solutions containing all three of the nutrient elements underwent decomposition, there was a formation of nitrites and ammonia, and consequently the decomposition caused poor plant growth. The solution in which there was no phosphate was not a good medium for the development of bacteria, consequently there was no decomposition of the mannite. Mannite as such does not seem to be harmful to wheat seedlings, and when decomposition does not take place the material would seem to be used by the plants and an increased growth results."

In further wheat-culture experiments in nutritive solution to which mannite was added in amounts of 100 parts per million and salicylic aldehyde in amounts of from 1 to 100 parts per million, it was found that "nitrites and ammonia formed in the duplicate mannite solutions and in those solutions which contained mannite together with 1, 5, and 10 parts per million of salicylic aldehyde. In the solutions which had no plants 25 parts per million and

more of salicylic aldehyde prevented any decomposition in the solution. In the solutions with plants it required as much as 50 parts per million of salicylic aldehyde in the mannite solutions to prevent decomposition. . . . In every case 25 to 50 parts per million of salicylic aldehyde in nutrient solution with mannite prevented any bacterial action."

Salicylic aldehyde was harmful to the growth of plants as well as to bacterial life.

The importance of soil colloids for agriculture and forestry, P. ROHLAND (*Forstw. Centbl., n. ser., 37 (1915), Nos. 6, pp. 257–263; 10, pp. 455–460*).—An additional contribution to the subject is given, covering practically the same ground as previous articles (E. S. R., 34, p. 18).

Colloidal clay, P. EHRENBERG and G. GIVEN (*Kolloid Ztschr., 17 (1915), No. 2, pp. 33–37*).—After a brief review of the work of others bearing on the subject, experiments with a highly plastic clay are reported, the results are taken to indicate that the colloids of clay exhibit all the general characteristics of emulsoids.

Moisture relations of some Texas soils, G. S. FRAPS (*Texas Sta. Bul. 183 (1915), pp. 36, figs. 6*).—Two years' studies supplementing experiments previously noted (E. S. R., 33, p. 619) on the moisture content of clay, black clay, loam, sand, clay loam, and black clay loam soils under different conditions and fertility treatments are reported. Curves are given showing the moisture content of the soils at different periods and the relation of the moisture to the rainfall.

It was found that the average quantity of water in soils after continued rains was 58 per cent of the water capacity measured in the laboratory, and the maximum quantity was 69 per cent. "The soils retained when saturated to a depth of 14 in. enough water for from 12.6 to 19.1 bu. of corn, or from 156 to 234 lbs. of lint cotton. The crop draws upon a greater depth of soil for moisture, but there are also great losses due to evaporation."

Both cultivation and manuring increased the quantity of water held at the ends of the wet periods. The soils retained at the ends of the dry periods, on an average of the two years, 44 per cent of the water capacity measured in the laboratory. The lowest quantities reached in 1911 were from 33 to 46 per cent of the water capacity; in 1912, from 21 to 41 per cent. Cultivation and manuring increased the water content of the soils at the ends of the dry periods and decreased the loss by evaporation. There was a variation of about 50 per cent in the capacity of the various soils to hold water during wet periods and to retain water during dry periods.

Absorptive power of soils of Mauritius, P. DE SORNAY (*Dept. Agr. Mauritius, Sci. Ser., Bul. 1 (1915) [English Ed.], pp. 18; abs. in Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases, 6 (1915), No. 10, pp. 1303, 1304*).—Two series of experiments with representative soils taken from different parts of the island of Mauritius are reported, the purpose of which was to determine their absorptive powers for ammonium sulphate, potassium nitrate, potassium sulphate, sodium nitrate, and calcium superphosphate. The first series consisted of percolation and the second of leaching experiments. Preliminary experiments showed that these soils when saturated contained an average of about 40 per cent of water, and that their average moisture content to a depth of 1 ft. was about 19 per cent.

The results of the main experiments led to the conclusion that the absorption of free or alkaline bases always takes place and that its intensity varies according to the nature of the soil. "In Mauritian soils this absorption of bases is particularly high when the conditions of experiments represent as nearly as

possible those of practice; and it may be said that the soil will give back, but with great difficulty and only after very heavy rainfalls, the ammonia and the potash retained. So long as rain falls slowly enough to prevent washing the soil will absorb high quantities of water which will be stored in the soil and subsoil, the latter remaining the reservoir of the cultivated soil. The soluble salts which are carried away will not be lost for plant growth. Surface tension and capillarity will bring them back to the surface. If rainfalls are heavy and compress the surface of the soil, washing will begin and a certain amount of cultivated soil will be carried away, together with the manure it contains."

The adsorption of potassium by the soil, A. G. McCall, F. M. Hildebrandt, and E. S. Johnston (*Jour. Phys. Chem., 20 (1916), No. 1, pp. 51–63, figs. 3*).—A résumé of literature bearing on the subject is given, and experiments with a sandy loam soil in its natural state and with the same soil when ground for four days in a porcelain-lined ball mill are reported. The object was to determine the amount of potassium absorbed from percolating solutions of potassium chlorid containing 62 and 78 parts per million of potassium. The flow of the solutions during percolation was maintained at the rate of about 50 cc. in ten minutes.

With the natural soil and the weaker salt solution, it was found "that the first ten-minute contact of the solution with the soil reduced its concentration from 62 parts per million to 40 parts per million. At the end of the second ten-minute period the strength of the solution is further reduced to 36 parts per million, but from this point the concentration of the solution rises until the fifth and last fraction is reached, when the concentration is within three parts per million of the concentration of the original solution. The amount of potassium retained by the soil rises gradually to 233 parts per million of the dry soil when 250 cc. of solution have passed through."

With the finely pulverized soil and the stronger salt solution, it was found "that the amount of potassium in the solution has been increased instead of decreased by its contact with the soil." This is explained in part on the basis that the soil gave up some of its potassium to the percolating solution, and in part on the basis of selective adsorption "in which the solvent (water) is adsorbed more rapidly than the dissolved potassium salt, with the result that the percolate is more concentrated than the original solution."

The absorption of the ultraviolet and infra-red rays by arable soil, J. F. Tristan and G. Michaud (*Arch. Sci. Phys. et Nat.* [*Geneva*], *4. ser., 39 (1915), No. 3, pp. 270–273, figs. 2; abs. in Internat. Inst. Agr.* [*Rome*], *Mo. Bul. Agr. Intel. and Plant Diseases, 6 (1915), No. 6, pp. 796, 797; Rev. Sci.* [*Paris*], *53 (1915), I–II, No. 16, p. 376; Sci. Abs., Sect. A–Phys., 18 (1915), No. 8, p. 401; U. S. Mo. Weather Rev., 43 (1915), No. 10, pp. 510, 511; Chem. Zentbl., 1915, I, No. 23, p. 1222*).—Experiments on the absorbing power of calcareous, sandy, clayey, and humus soils, when dry and when damp, for the two invisible ends of the solar spectrum are reported, in which the photographic method was employed. The ultraviolet rays were isolated by filtering sunlight through a quartz lens covered with a very thin film of silver. A Wood filter was used for the separation of the infra-red rays.

It was found "that infra-red light is much less absorbed by damp soil of all four types than by dry and that the soils absorb these rays in the following ascending order: Calcareous, clayey, sandy, and humus. The ultraviolet light also is less absorbed by damp than by dry calcareous soil, but the difference is less for sandy soil and becomes imperceptible in the case of humus and clayey soils. The intensity of absorption is least in the case of calcareous soil, which

is followed by sandy soil, while it is greater for humus and clayey soils. The difference of behavior toward the rays of the two invisible ends of the spectrum is greatest in dry clayey soil. While this absorbs ultraviolet light very readily, it absorbs very little infra-red light."

Soil temperatures, J. W. LEATHER (*Mem. Dept. Agr. India, Chem. Ser., 4 (1915), No. 2, pp. 19–84, pls. 8, figs. 7*).—Two years' observations on the temperature of cropped and fallow alluvial soils at Pusa containing a high proportion of calcium carbonate are reported. The temperatures were taken by means of self-registering thermometers placed horizontally in the undisturbed soil at depths of 1, 2, 3, 6, 9, 12, 18, and 24 in.

It was found that the temperature of the surface soil varied naturally with the hour of the day and with the season, the seasonal variations being minimum in January and maximum in May. In bare fallow soil "the diurnal change of temperature extends to between 12 and 24 in. from the surface on most days in the year. At 12 in. it amounts to about 1° C., but at 24 in. it is doubtful whether it ever exceeds 0.1° in Bihar and probably does not exceed 0.2° in any part of India.

"There is a fairly close correspondence between the temperature of bare fallow soil at 1 in. from the surface and that of the air in the shade. Approximately the soil minimum at this depth is about 2° higher than the air minimum, and the soil maximum is about 3° higher than the air maximum. There is also a similarly close relation between the diurnal change of temperature in the soil (bare fallow) at 1 in. from the surface and in the air (shade), the diurnal change being about 1.5° greater in the soil at this depth than in the air. This diurnal change is least during the monsoon and greatest during the dry season. At the former season (June to September) it is about 10° in the soil (bare fallow) at 1 in. deep, and during the latter (in March and April) it frequently approaches 20°.

"The temperature of the soil near the surface (down to 3 or 4 in.) is above the mean temperature for only about 8 hours daily, while it is below it for about 16 hours. The lag in temperature is about 2 hours at 3 in. deep and about 8 hours at 18 in. from the surface. A change in the specific heat of the soil, due to change of moisture content, does not seem to affect the maxima or minima; but rainfalls during the dry season, causing a considerable change in the amount of water evaporating, have a marked effect. . . .

"The effect of a covering crop on the soil temperature is very marked, for it both prevents the surface soil from rising to the temperature which fallow land assumes and also modifies the diurnal change. Thus while the temperature of exposed soil at 1 in. deep rises to about 3° above that of the air, that of cropped land is about 2° below it, and while the temperature of exposed soil at the surface rises to probably some 20° above that of the air, the corresponding figure for cropped land is only some 2 or 3° even in March, while in the rains it is actually lower than that of the air. Also in respect of diurnal change, at 1 in. deep, while exposed soil suffers a change of some 20° in March, that of cropped land is only about 13° at the same depth, and during the monsoon, while exposed soil suffers a diurnal change of some 10° at 1 in. deep, that of cropped land is only about 3 to 4°."

Droughts, rainfall, and soil erosion (*Union So. Africa Senate, 4. Sess., 1. Parliament, 1914, June 19, pp. XII+55+XXVIII, pls. 2*).—This is a report of an investigation by a committee of the senate of the Union of South Africa regarding the occurrence and variation of rainfall in South Africa, the causes and extent of soil erosion, and the drying up of certain areas in the Union, with suggestions of possible remedial measures.

Among the general conclusions reached from this investigation are that while the distribution of rainfall varies widely in different parts of the country from year to year and month to month and in proportion to the distance from the coast, the available evidence goes to show that there has been no definite diminution in the total rainfall of South Africa during historic times. There is, however, some evidence of cyclic or periodic variations. While denudation of the forested and grassed areas has not appreciably affected the total rainfall, it has been an important factor in increasing soil erosion. Other important factors are the making of roads, tracks, or paths, and the grazing of stock. It is stated that the combined effect of these various agencies "has been calamitous in the extreme."

The conditions which favor soil erosion have also been responsible for the drying up of the lands in certain parts of the country. Increased surface run-off has been accompanied by less penetration of moisture into the soil, and the formation of numerous gullies and drainage channels has resulted in the lowering of the underground water. The evidence appeared to be unanimous and conclusive "that many parts of the Union, in spite of the apparent constancy of the total amount of the rainfall, have been slowly but surely drying up, the rate of desiccation varying with the differences of locality, soil, and gradients; and that such parts must sooner or later become useless and uninhabitable if the process proceeds unchecked."

Among the remedial measures proposed are conservation of water by means of dams and irrigation works, encouragement of fencing, the increase of vegetation, control of veld burning, afforestation and reseeding to grass, and more attention to drainage in the construction of roads and railways.

The prevention and control of erosion in North Carolina, with special reference to terracing, F. R. Baker (*North Carolina Sta. Bul. 236* (*1916*), *pp. 27, figs. 25*).—This bulletin, prepared in cooperation with this Department, states that the area in which soil erosion is especially active in North Carolina is almost wholly within the Piedmont region, but that a considerable amount of the western Coastal Plain is subject to erosion, the whole area so affected covering over 10,000,000 acres. Methods discussed for the prevention of erosion are (1) proper cultivation, (2) tile drainage, (3) hillside ditches, and (4) terracing. The falling and level terraces are given the most attention.

"Of the two terraces the broad, level terrace is more ideal, but its use is limited to soils in good physical condition. The falling terrace can be more generally used and is probably best adapted to the conditions found generally in North Carolina. The fall of the terrace varies with the state of cultivation between 6 in. in 100 ft. and a dead level. The level terraces should be spaced three or four feet apart (vertical distance); and the falling terraces four or five feet apart (vertical distance). A broad mound should be maintained whether a level or falling terrace is used."

Useful accessories, including levels and terrace drags, are also described.

The increase of the ecological value of light soils by intermixing clay (Betonung), C. Schneider (*Fühling's Landw. Ztg.*, *64* (*1915*), *No 13–14, pp. 352–366*).—The author enumerates and discusses the factors influencing the ecological value of a soil, and, considering light sandy soils and heavy clay soils as representing practically the limits of soil texture, points out how a proper mixture of clay or clay soil with a light soil will indirectly increase the ecological value of the latter by favorably influencing the factors mentioned and resulting in a normal soil. A general classification of soils on the basis of their content of sand and clay is given, and the relations between the different classes and normal soils for different crops is discussed.

The use of dynamite in the improvement of heavy clay soils, L. E. CALL and R. I. THROCKMORTON (*Kansas Sta. Bul. 209 (1915), pp. 34, figs. 8*).—A series of experiments to determine the effect of dynamiting on the yield of different field crops, on the physical condition, moisture and bacterial content, and nitrifying powers of the soil, on the leaching of salts in alkali soil, and on the growth and vitality of fruit trees is reported. From one-half to one stick of dynamite was placed from 2½ to 3 ft. deep and from 15 to 20 ft. apart. While some benefits from dynamiting were observed in some cases, it was found that "in no instance was there improvement sufficient to pay the expense of dynamiting." The authors conclude that "heavy plastic clay soils will seldom, if ever, be found dry enough under field conditions in humid climates to be shattered or cracked by explosions of dynamite, and that the physical condition of such soils will usually be injured rather than benefited by dynamiting."

The box method of testing manurial requirements of soils, G. DE S. BAYLIS (*Jour. Agr. [New Zeal.], 11 (1915), No. 2, pp. 97–105, figs. 5*).—A box culture method for testing the value of different fertilizer mixtures and for determining incidentally the factor or factors limiting the productiveness of a soil is described.

Liquid manure (*Dept. Agr. and Tech. Instr. Ireland Jour., 16 (1915), No. 1, pp. 26–32, pl. 1, figs. 3*).—Experiments on hay lands to determine the value of liquid manure applied at the rate of 16 tons per acre, as compared with barnyard manure applied at the same rate, and a complete artificial mixed fertilizer applied at the rate of 500 lbs. per acre, showed that the three manures produced very similar results, but on the average slightly in favor of the liquid manure. Methods of collection, storage, and distribution of liquid manure are briefly described.

The action of the nitrogen of sodium nitrate, ammonium sulphate, and lime nitrogen, S. HERKE (*Kisérlet Közlem., 18 (1915), No. 2, pp. 266–306*).—Ten years' pot-culture experiments with barley, mustard, oats, and poppies on different soils to determine the relative values of sodium nitrate, ammonium sulphate, and lime nitrogen as sources of nitrogen are reported.

The kind of soil had a marked influence on the action of lime nitrogen. It had the most favorable action on loam soils rich in lime and humus, where it equaled ammonium sulphate in effectiveness. On sand soils rich in lime but poor in humus and on loam soils rich in humus but poor in lime, the lime nitrogen had a less favorable action than the other two fertilizers. Considering the effect of sodium nitrate as 100, in the first case the effect of ammonium sulphate was 92 and of lime nitrogen 62, and in the second case that of ammonium sulphate was 84 and of lime nitrogen 61. Lime nitrogen was in general favorable to the same plants as was ammonium sulphate, although its action was usually less marked. The final average results with all the crops and all the soil types showed that with sodium nitrate taken at 100, ammonium sulphate stood at 91 and lime nitrogen at 70.

The relative action of the nitrogen of lime nitrogen and of sodium nitrate, J. GYÁRFÁS (*Kisérlet. Közlem., 18 (1915), No. 2, pp. 307–325*).—Three years' field experiments comparing the fertilizing action of sodium nitrate and lime nitrogen when used under winter rye, barley, and potatoes on meadow, and as a top-dressing for winter-seeded crops, showed that on the average, taking the effectiveness of sodium nitrate as 100, that of lime nitrogen was 66. No relation was observed between the kind of soil and the fertilizing action of lime nitrogen, except that on an excessively damp, acid meadow soil the lime nitrogen had little effect and in some cases was injurious.

Cause of the red coloration sometimes observed on decomposing Thomas slag with sulphuric acid, H. DITZ (*Jour. Prakt. Chem., n. ser., 91 (1915), No.*

12, pp. 507–520; abs. in Jour. Soc. Chem. Indus., 34 (1915), No. 18, p. 972).—Experiments are reported, the results of which are taken to indicate that the red coloration given by certain kinds of Thomas slag when decomposed with strong sulphuric acid is due to the presence of trivalent manganese, mainly in the form of a mangani-phosphoric acid compound. The color was also given by other kinds of basic slag to which potassium permanganate was added. By properly varying the conditions of temperature and oxidation it was possible to obtain, from the slag leaving the converter, a product giving a green-blue or red coloration with sulphuric acid. The oxidation of manganous oxid in slag, it is thought, can be promoted under certain conditions by the presence of free lime. It is considered probable that the proportion of ferrous oxid to manganese in the slag also has an influence on the formation of a compound giving a red coloration with sulphuric acid.

The pebble phosphates of Florida, E. H. Sellards (*Fla. Geol. Survey Ann. Rpt., 7 (1914), pp. 25–116, pl. 1, figs. 51*).—This paper deals in detail with the origin, location, and conditions of deposition of the land and river pebble deposits of Florida.

Possible sources of potash in America, F. K. Cameron (*Jour. Franklin Inst., 180 (1915), No. 6, pp. 641–651; Amer. Fert., 44 (1916), No. 2, pp. 21–26; Sci. Amer. Sup., 81 (1916), No. 2089, pp. 34, 35*).—This is a discussion of desert basins, alunite, and kelp as possible sources of potash in America. It is concluded that "there are within the United States large stores of raw materials from which it is possible to obtain ample supplies of potash salts; that the technology of the subject is sufficiently developed to demonstrate the entire practicability of a supply from native sources, so far as physical factors are concerned."

Statistical potash fertilizer experiments in 1914, with special reference to top-dressings and meadow fertilization, M. Hoffmann (*Mitt. Deut. Landw. Gesell., 30 (1915), No. 38, pp. 560–566*).—A classified review of a number of experiments along this line is given.

The importance of fineness of subdivision to the utility of crushed limestone as a soil amendment, W. Thomas and W. Frear (*Jour. Indus. and Engin. Chem., 7 (1915), No. 12, pp. 1041, 1042*).—The substance of this article has been noted from another source (E. S. R., 34, p. 133).

The lime magnesia ratio in soil amendments, W. Thomas and W. Frear (*Jour. Indus. and Engin. Chem., 7 (1915), No. 12, pp. 1042–1044*).—The substance of this article has been noted from another source (E. S. R., 34, p. 133).

The effects of radio-active ores and residues on plant life, M. H. F. Sutton (*Reading, Eng.: Sutton & Sons, 1914, Bul. 6, pp. 15, figs. 4*).—Box and laboratory experiments, described previously in a brief note by Bastin (E. S. R., 33, p. 123), to determine the influence of two radio-active ores containing, respectively, 8 and 9 mg. of radium bromid per ton, of radium mine residue containing the equivalent of 1.8 mg. of radium bromid per ton, and of black oxid of uranium, on the growth of radishes, lettuce, peas, tall nasturtiums, and flowering annuals, and on the germination of red clover, smooth stalked meadow grass, and rape, are reported in detail. The radio-active ores were added to the vegetables at rates of from 1 part of ore to 12 parts of soil, to 1 part of ore to 48 parts of soil, and to tall nasturtiums at rates of from 1:14 to 1:2,240 parts of soil. The radium residue was added to nasturtiums at the same rates as the ore. Black oxid was added to the flowering annuals at the rate of 1 part to 2,000 parts of soil.

The results obtained "afford some evidence that radium emanations possess the property of developing and increasing growth. Many of the radish, lettuce,

and pea trials which were dressed with radio-active ore showed considerable superiority over those grown in plain soil, but the cost of the ore far outweighed the worth of the larger crop. . . .

"No material difference in results was apparent between the trials with ore incorporated with the soil and those with ore placed at the bottom of the boxes or pots. The quantity and degree of radio-active material to insure the best return can not be definitely stated, but it would appear that a light dressing is likely to give as good results as a larger amount. In the trials with rape seed, the influence of the radio-active material in accelerating germination was most consistent in all the tests, but it was evident that a very small quantity of low-grade residue proved as effective as a considerable amount of ore containing a much larger proportion of radium."

In the laboratory germination tests "there is no indication that better results are obtainable with ore possessing considerable radio-activity than with residue of low value, nor have these trials generally proved superior to the 'controls.'"

The influence of radio-active earth on plant growth and crop production, H. H. Rusby (*Radium, 4 (1915), Nos. 4, pp. 68–74, 5, pp. 94–104*).—The substance of this article has been previously noted from another source (E. S. R., 33, p. 123).

Some chemical aspects of the peat problem, G. T. Morgan (*Dept. Agr. and Tech. Instr. Ireland Jour., 16 (1915), No. 1, pp. 39–45, pls. 4*).—This article deals with the products of the peat industry, referring in particular to the production of ammonium sulphate and peat ash as fertilizers.

Commercial fertilizers, H. E. Curtis and W. Rodes (*Kentucky Sta. Bul. 196 (1915), pp. 239–371*).—This bulletin contains the results of analyses and estimated valuations of 734 samples of fertilizers and fertilizing materials offered for sale in Kentucky during 1915.

"The results of these analyses show that in most cases the samples analyzed have come fully up to the guaranty, or where there is a slight deficiency in one ingredient, it has been made up by an excess in one or both of the other ingredients. In a few instances, the deficiency in one ingredient, while fully made up by an excess of the other ingredients, is still too large to be considered acceptable."

AGRICULTURAL BOTANY.

Experimental studies in the physiology of heredity, F. F. Blackman et al. (*Abs. in Rpt. Brit. Assoc. Adv. Sci., 84 (1914), pp. 245–247*).—This is a report on work being conducted by Edith R. Saunders, R. P. Gregory, and Miss A. Gairdner.

In the study of half-hoariness in stocks and its relations to the glabrous and hoary forms a new half-hoary race has been obtained, which is being employed in a new series of experiments. Progress is reported in the further study of gametic coupling.

It has been found that the double-flowered plants, at least in some strains, make a more rapid and vigorous growth than the singles.

A beginning has been made in the work of obtaining a complete series of types of known factorial constitution for use in further study of the interrelations between the factors determining hoariness and sap color.

Experiments investigating the cytology and genetics of certain giant races of *Primula sinensis* found to be in tetraploid condition have given results which are summarized in the statement that reduplication of the chromosomes is accompanied by a reduplication of the series of factors.

The investigations of Gregory on inheritance of green, variegated, and yellow leaves in Primula have been noted previously (E. S. R., 34, p. 226).

Heredity and mutation as cell phenomena, R. R. GATES (*Amer. Jour. Bot., 2 (1915), No. 10, pp. 519–528*).—This is a discussion of several characters and their inheritance in certain Œnotheras, based upon the conceptions which the author favors of variation and inheritance, namely, the process by which new differences arise and the process by which they are perpetuated.

Not only do parallel mutations occur independently in species widely apart, but wide differences are found in the types of change which give rise to them. Emphasis is laid on the statement that each mutation is the result of a cell change which is repeated in every part of the organism, having originated in the fertilized egg. A mutant is such because not only germ cells but somatic cells contain a certain peculiarity. It is thought that a female animal, like a mutant, is somatically distinguished by a different chromosome content in all its tissues and that many important implications lie in this fact.

The *Œ. rubricalyx* character is considered an example of a mutation fundamentally chemical, though the precise nature of the change by which it is produced is as yet unknown. It is thought probable that *Œ. rubricalyx* is also a cell mutation, the nuclei in all parts containing a descendant of the original changed chromosome. Parallels to this mutation are found in such plants as the copper beech and the red sunflower, which belong to widely separated groups.

Genetical studies on Oxalis, S. NOHARA (*Jour. Col. Agr. Imp. Univ. Tokyo, 6 (1915), No. 2, pp. 165–182, pl. 1*).—The results are given of a study of several forms of Oxalis growing in Tokyo and its vicinity. A number of these forms, which are characterized by differences in flower and leaf color, were grown as pedigreed plants and used in crossing experiments.

As a result of the culture work some of these forms were found to be distinct biotypes. In the materials employed the presence or absence of purple in the corolla and leaves was used as a distinctive character. This color is said to be due to the presence of a purple cell sap. Four of the five pedigreed cultures were found to be pure types, while one split into forms of the pure types upon self-fertilization. In the hybrids the presence of a factor or factors of purple color was found dominant over the absence of the same. An F_1 generation was found intermediate in color intensity between its parents. The two reciprocals of any of the hybrids were found to be of exactly the same nature so far as the author's investigations are given.

Self-pollination and the possibility of artificial cross-pollination in rice, R. FARNETI (*Atti Ist. Bot. R. Univ. Pavia, 2. ser., 12 (1915), pp. 351–362, pl. 1*).—The author has studied the possibility of accomplishing artificial fertilization in rice. It was found that with sufficient skill and patience this could be brought about at the proper stage by introducing a fine instrument through the minute opening at the points of the glumes. It was, however, difficult to avoid causing self-fertilization or injury resulting in sterility.

The nature of peloria in flowers, M. J. SIRKS (*Ztschr. Induktive Abstam. u. Vererbungslehre, 14 (1915), No. 2, pp. 71–79*).—The author, giving results of his own studies, holds with Vöchting (E. S. R., 9, p. 1027) that peloria is due, not to external conditions primarily, but to the operation of causes which are interior to the plant itself and bound up with the constitution of the species. In the cases studied, peloria and fasciation appear to be the results of independent processes. A bibliography is given.

The nature of peloria, M. J. SIRKS (*Arch. Néerland. Sci. Exact. et Nat., Ser. 3 B, 2 (1915), No. 2, pp. 239–283, figs. 3*).—This is a more extended presentation of the material above reported, with a discussion of heredity and of external influences as related to peloria.

Recent studies on the formation of flower coloring materials, ELISABETH SCHIEMANN (*Ztschr. Induktive Abstam. u. Vererbungslehre, 14 (1915), No. 2, pp. 80–96*).—This is a brief discussion of the results of studies reported during 1902 to 1914 by a number of authors listed with their contributions. The material, which is regarded from the standpoint of Mendelian splitting, is discussed under the main heads of the glucosid-splitting enzym, the oxidases, the limiting factor, and the chromogens.

The relation between vegetative vigor and reproduction in some Saprolegniaceæ, A. J. PIETERS (*Amer. Jour. Bot., 2 (1915), No. 10, pp. 529–576, figs. 2*).—The author, reporting a study of *S. ferax*, *S. monoica*, *Achlya racemosa*, and *A. prolifera*, states that there is no constant relation between vegetative growth and sexual reproduction when the concentration of the food supply exceeds the minimum requirement of the species therefor. This is not far from 0.1 per cent of peptone for the production of both sporangia and oögonia.

Tendencies developed by a mycelium while growing vegetatively may affect the number and character of the reproductive organs produced later under different conditions. Maltose and levulose are especially favorable among the carbohydrates used as regards vegetative growth, and the latter has an especial value for the production of oögonia. Sucrose is probably not used by species of Saprolegnia or of Achlya unless it is first inverted by some other agency. Phosphates tend to increase the reproductive capacity of the fungus.

The achievement of comparable results requires the use of a medium of definite and known composition.

A bibliography is given.

On the influence of nutrition upon the development of sexual organs in the fern prothallia, I. NAGAI (*Jour. Col. Agr. Imp. Univ. Tokyo, 6 (1915), No. 2, pp. 121–164, pl. 1, figs. 7*).—On account of recent investigations showing the effect of nutrition on the development of sex in plants, the author made a study of the influence of nutrition on the development of sexual organs in the gametophytes of *Osmunda regalis japonica* and *Asplenium nidus*.

The prothallia were grown from spores in Knop's solution, and it was found that the development of antheridia and archegonia was dependent upon the concentration of the solution in which they were grown. The prothallia of *O. regalis japonica* grown in solutions which lacked calcium and magnesium salts were almost completely sterile. Starch was found to accumulate abnormally in the chlorophyll bodies of prothallia of Osmunda which were grown under a nitrogen-hungry condition, but a normal condition was soon restored if weak solutions of ammonium salts and nitrates were supplied.

Relation of moisture to seed production in alfalfa, J. N. MARTIN (*Iowa Sta. Research Bul. 23 (1915), pp. 302–324, figs. 2*).—A report is given of investigations conducted to determine the cause of the frequent failure of alfalfa to produce seed in Iowa.

As a result of laboratory and other experiments, it was determined that the proper functioning of alfalfa pollen is the limiting factor in seed production. For the germination of the pollen, a proper supply of water is required, and a certain ratio between the moisture delivered by the stigma and the moisture of the air was found necessary. When the optimum supply of soil and atmospheric moisture is present, an increase in soil moisture resulting in an increased moisture delivery of the stigma, or a change in the atmospheric moisture disturbs the supply for pollen germination and prevents fertilization. The blasting of seed is said to be commonly due to arrested development, and this may be brought about by inability on the part of the plant to furnish the proper water and food supply, or it may be due to pathological conditions to which the seed is susceptible under drought conditions.

The presence and physiological significance of tannin in plants, C. VAN WISSELINGH (*Bot. Centbl., Beihefte, 32 (1915), 1. Abt., No. 2, pp. 155–217, pls. 2*).—The author describes researches carried on by himself with *Spirogyra maxima* as regards tannin. It is claimed that this plant contains a substance closely allied to gallotannin in the cell sap, and that the precipitate obtained by the use of certain bases is a tannin and not a nitrogen product. Antipyrin and caffein have proved to be well adapted to the demonstration of tannin in living cells without injury thereto.

It is thought that in case of *S. maxima* the tanin present in the cell sap is not an excretion product or a reserve material, but a solute in process of utilization by the plant along with other dissolved substances.

Correlations appear to exist between tannin and other bodies, as chromatophores and starches.

Elaioplasts in monocotyledons and dicotyledons, I. POLITIS (*Atti Ist. Bot. R. Univ. Pavia, 2. ser., 12 (1915), pp. 345–350*).—The author claims to have found elaioplasts in 27 species representing 19 genera of monocotyledons, and in the Malvaceæ among the dicotyledons. They are to be regarded as the specific organs of the cell which are concerned with the elaboration of oily material. Elaioplasts are regarded as fundamentally similar in substance to the nucleoli. In bulbs, it is stated, new elaioplasts are formed with each resumption of vegetative activity.

The electrical conductivity of sap in vegetable tissues, EVA MAMELI (*Atti Ist. Bot. R. Univ. Pavia, 2. ser., 12 (1915), pp. 285–297*).—The author shows that successive degrees of torsion or pressure to which the tissues of *Opuntia ficus indica* and of *Agave americana* were subjected gave corresponding increases in the conductivity of the expressed sap.

In case of *Diotostemon hookeri, Aloe grandidentata,* and *A. africana,* permitted to dry slowly at from 16 to 20° C., the specific conductivity diminished at first, but later increased. In case of the last two of these and of *A. striata,* it appears that the specific conductivity decreases with the age of the organs.

In *O. ficus indica* and *Agave* sp., the specific conductivity of leaf tissue from the basal region exceeded that from the apical portions.

Studies on wilting, drying, and returgescence of plants, H. HOLLE (*Flora [Jena], n. ser., 8 (1915), No. 1–3, pp. 73–126, figs. 6*).—The author has studied various plants as to the conditions in the vascular elements in wilting or drying shoots, the changes in living parenchyma cells while drying out, the relations of air to drying cells, and the restoration of turgor, including the influence of temperature in this connection. He has also considered some implications of water movement theories.

It is stated that in the neighborhood of wounds the concentrating cell sap withdraws water from the uninjured cells. The cell membranes shrink with the diminution of the cell contents. The shrinking of the cell wall is noted in dead as well as in live cells. Small, gas-filled spaces may appear in the parenchyma cells as they dry, but they do not restore the form of the crinkled cell membrane. Thin walled parenchyma cells show no such bubbles, being squeezed together in a compact mass. While dead cells are losing their water, cohesion tensions are set up of various degrees of intensity before the gas bubbles appear. Penetration of membranes by air in case of pressures of one atmosphere or less does not occur so long as the cell is filled with water. Restoration of turgor in detached shoots occurs in warm water somewhat more quickly than in cold, within certain limits of resistance of the cut surface.

A bibliography is appended.

Some relations of plants to distilled water and certain dilute toxic solutions, M. C. MERRILL (*Ann. Missouri Bot. Gard., 2 (1915), No. 3, pp. 459–506,*

pls. 4, figs. 4; Amer. Jour. Pharm., 87 (1915), No. 12, pp. 549–555; 88 (1916), Nos. 1, pp. 12–22; 2, pp. 71–82, figs. 3; 4, pp. 156–164, fig. 1).—Briefly reviewing related contributions, the author outlines his own work with *Pisum sativum* and *Vicia faba*.

Renewing the distilled water every four days increased the growth of the top and roots, lengthened the life of the plants, and continued growth longer after they were placed in a full nutrient solution. The period between 5 and 10 days in distilled water appears to be a critical one for these plants as regards complete recovery in a full nutrient solution. Sterilizing the distilled water every four days by boiling for ½ hour favored continued growth. Greater total exosmosis was obtained in the renewed than in the unrenewed distilled water.

Normal plants grown for some time in a full nutrient medium and then transferred to distilled water exhibited at first greater excretion than absorption of electrolytes, but after a day or two absorption was in excess and conductivity declined, sometimes for a considerable period of time. The conductivity curve of the full nutrient solution fell for about the first 15 days of growth therein to a horizontal which was maintained for about 50 days. The growth curve was in general opposite to that of conductivity. Exceptional features are also noted. Greater deterioration of the roots in distilled water occurred if the plants had not previously been grown in full nutrient solution.

The conclusion is thought to be justified that pure distilled water is not of itself toxic or injurious to plants, and that various other factors must aid in causing the deterioration observed in this connection. The author inclines to the view that, while exosmosis of food materials or nutrient salts is not responsible for the injury observed, the question of food relations does play an important part in the incipiency of the trouble, this being quickly followed by factors initiated as a result of the inimical food or nutrient relation. It is thought possible that in the absence of available food the tissues of the plant begin to disorganize and thus fall a ready prey to fungus and bacterial action, which continues and extends the injurious effects.

A bibliography is given.

Electrolytic determination of exosmosis from the roots of plants subjected to the action of various agents, M. C. MERRILL (*Ann. Missouri Bot. Gard., 2 (1915), No. 3, pp. 507–572, figs. 18*).—In this paper are given the results of studies on the effects of agencies which are considered as actively injurious, as distinguished from the operation of the agencies considered in the paper above noted. An attempt was also made to determine the approximate boundary between normal and abnormal exosmosis.

It was found that pea seedlings grew better in distilled water in which exosmosis from previously treated plants of the first crop had occurred than in fresh distilled water or in that in which untreated plants had been grown. Peas or horse beans grew better in fresh distilled water than in distilled water in which seedlings had already grown for 21 days.

Abundant exosmosis may occur from treated plants, the roots remaining normal in appearance. Anesthetic vapors cause marked exosmosis after long exposure, the order of greatest effectiveness being chloroform, illuminating gas, and ether. The time limits for the exposure to extremes of temperature in relation to exosmosis were determined, and comparison was made between the effect of dry and that of moist heat. The exosmosis curves were found for various organic compounds, which, at the concentrations used, produced marked excretion, and the effects of salts, singly and in pairs and with anesthetics in solution, were ascertained. Antagonistic relations were not discovered in the course of this work.

The effects of heat and cold are considered as resulting in a complete or incipient disorganization of the cell, depending upon the duration of exposure and a consequent escape of some of the contents. The observations here recorded are not considered to substantiate the view that anesthesia is a reversible process, the excretion process induced by an anesthetic conforming in every way to an irreversible chemical reaction. It is further believed that the results obtained by antagonistic pairs of salts and by single salts are also to be explained, as far as resulting exosmosis is concerned, in the specificity of the action of each.

A bibliography is appended.

The question of the toxicity of distilled water, R. P. Hibbard (*Amer. Jour. Bot., 2 (1915), No. 8, pp. 389–401*).—The author refers to articles by Livingston, Hoyt, and True, respectively (E. S. R., 19, p. 13; 31, pp. 32, 730) as affording a complete summary of the work done in the past on the toxic effects of distilled water. This is said to have been about equally divided between animal and plant physiologists. He then details his own investigations, employing as indicators the roots of *Lupinus albus* and relating first to the problem of adjustment and second to that of toxic root excretions.

It is held that by some process of acclimatization or adjustment, lupine seedlings give better growth in distilled water if change to that medium from tap water is made gradually rather than suddenly, and that this fact should never be neglected in cultural work. It appears also that roots of lupine seedlings excrete a substance that inhibits growth therein and produces also abnormalities of development as regards form and direction. It is thought that the harmfulness of distilled water may be considered as due, not to any one predominant factor, but to a resultant of many, consisting of a disturbance of the normal equilibrium of the various chemical and physical interactions within the organism and between it and its environment.

Plant records of an expedition to Lower California, E. A. Goldman (*U. S. Nat. Mus., Contrib. Nat. Herbarium, 16 (1916), pt. 14, pp. 309–371+XIII, pls. 31*).—A list is given of plants collected in Lower California in 1905 and 1906, along with notes on distribution and descriptive, ecological, and economic data. The work includes descriptions of three new species of oak, *Quercus brandegei, Q. idonea,* and *Q. devia.*

New or noteworthy plants from Colombia and Central America, V, H. Pittier (*U. S. Nat. Mus., Contrib. Nat. Herbarium, 18 (1916), pt. 4, pp. 143–171+IX, pls. 24, figs. 10*).—The author describes a number of trees and shrubs of Central America and northern South America which were hitherto imperfectly known or not described.

FIELD CROPS.

Moisture content and shrinkage of forage and the relation of these factors to the accuracy of experimental data, H. N. Vinall and R. McKee (*U. S. Dept. Agr. Bul. 353 (1916), pp. 37*).—This bulletin is a report on a series of experiments made during 1914 to secure data on which to base a sampling system giving greater accuracy to field tests in forage experiments. The plan consists essentially in taking small samples at the time of weighing field-cured or green material for use in determining the moisture content of the material and applying the data in reducing the yield either to an air-dry or to a dry-matter basis.

In the experiments described the efficiency of correcting ordinary green and field-cured forage weights with 2, 4, 6, 8, 12, or 16 lb. samples was determined with a number of crops at different points. Of ordinary field-cured forage 100 lbs. was taken from the shock or windrow and 500 lbs. of green forage was

taken immediately after cutting and placed on a canvas to prevent loss of weight other than moisture. When this forage had become sufficiently dry the lots were placed in burlap bags and kept in an open shelter until they ceased to lose weight. Composite samples of 2, 4, 6, and 8 lbs. of field-cured forage, part from the outside and part from the inside of shocks, were secured at the same time and from the same material as the 100-lb. lots before mentioned and allowed to become perfectly air-dry. Samples 4, 8, 12, and 16 lbs. in size of green forage were taken immediately after cutting and were treated similarly. Samples were replicated five or six times to check the variation due to sampling. All samples were taken at the stage of maturity generally recognized as the proper cutting time for each crop. The data secured are arranged in tables and discussed.

The study of the use of samples in correcting forage yields indicated that air-dried samples, while a little less accurate than oven-dried samples, can be relied upon for all practical purposes in correcting forage yields. Much greater extremes were found in the samples of field-cured material than in the samples of green material. It is believed that with the proper care in sampling correction by means of samples can be accurately made from either green or field-cured material. The percentage of moisture in different crops when these are ordinarily harvested for forage was as follows: Alfalfa at Chico, Cal., 75 to 78 per cent, average 76.9 per cent; alfalfa at Arlington Farm, Va., 74 to 76.5 per cent, average 75.2 per cent; tall oat-grass and orchard-grass mixture at Arlington Farm, Va., 71 to 73 per cent, average 72 per cent; timothy at New London, Ohio, when in full bloom, average 67.2 per cent; sorghum at Amarillo, Tex., 70 to 73 per cent, average 71.2 per cent. The average amount of moisture found in field-cured material was as follows: Alfalfa, 22.3 per cent; timothy, 20.3 per cent; tall oat-grass and orchard-grass mixture, 29 per cent; sorghum, 43.2 per cent. It is stated that the moisture content of field-cured material varies so widely that it can not be foretold with accuracy.

The following results were secured in the study of the relation of the moisture content to the stage of development: Alfalfa at Chico, Cal., very young (12 in. high), 78.9 per cent; one-tenth in bloom, 77.1 per cent; full bloom, 74.6 per cent; past full bloom, 73.4 per cent. Sorghum at Amarillo, Tex., very young, 90.6 per cent; shooting for heads, 87.1 per cent; beginning to head, 84.8 per cent; full bloom, 80.4 per cent; seed ripe, 75.3 per cent. The results with sorghum at Hays, Kans., showed practically the same gradations as at Amarillo, Tex. Timothy at New London, Ohio: Very young (10 to 12 in. high), 77.5 per cent; just heading, 76.6 per cent; early bloom, 71.4 per cent; full bloom, 67.2 per cent; leaves drying, 58.6 per cent; seed mature, 51.2 per cent.

The results of a study of the rate of loss of moisture in forage during the early stages of curing are shown in the following table:

Approximate moisture losses in different crops during the first four hours of curing.

Crop and location.	Moisture loss.				
	½ hour.	1 hour.	2 hours.	3 hours.	4 hours.
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
Alfalfa at Chico, Cal	....	17	35	....	69
Alfalfa at Arlington Farm, Va	6	14	23	28	32
Tall oat-grass and orchard grass at Arlington, Va	5	12	24	30	34
Timothy at New London, Ohio	6	10	18	25	30
Sorghum at Hays, Kans	2	5	9	12	13

It was observed that the rate of loss of moisture after cutting differed in different varieties of the same crop as well as in different crops. Arabian alfalfa lost moisture faster than Peruvian or ordinary alfalfa in the first one or two hours after cutting, but the total percentage of moisture was about the same in the three varieties. A high percentage of leaf surface in alfalfa was correlated with a rapid loss of moisture immediately after cutting, but it did not indicate a high moisture content.

Studies of the shrinkage in hay after storing and variation of moisture content due to changes in atmospheric humidity showed that at Chico, Cal., baled oat hay in 1914 lost 8.1 per cent in weight between June 1 and August 31, and gained 5.9 per cent of the original weight from August 31, 1914, to February 25, 1915. The results at this point indicated that even baled hay responds noticeably to changes in atmospheric humidity. Results secured at New London, Ohio, with loose timothy indicate a shrinkage of 8.6 per cent in one lot and 15.6 per cent in another lot when the hay was stored in a barn for about three months. The effect of a week of rainy weather was indicated by an increase of weight in the loose hay.

A method of correcting for soil heterogeneity in variety tests, F. M. Surface and R. Pearl (*U. S. Dept. Agr., Jour. Agr. Research, 5 (1916), No. 22, pp. 1039–1049, figs. 4*).—This article, from the Maine Experiment Station, proposes a method for use in correcting for differences in the soil of different plats, when the plats are arranged in a certain definite way.

The method involves in the first place the determination of the probable yield by the contingency method. This calculated yield is taken as representing the most probable yield of each plat on the supposition that they have all been planted with a hypothetical variety whose mean yield is the same as the observed means of the field. This calculated yield is used as a basis for determining a correction factor. If the calculated yield of a given plat is above the mean of the field, it is regarded that the soil of this plat is better than the average of the field and a corresponding amount is deducted from the observed yield. If the calculated yield is below the average, a proportional amount is added to the observed yield in order to make the plats comparable. The results are considered still more comparable if the correction factors are based upon the percentage of the mean rather than upon the absolute figures. An application of the method upon experimental plats led to results which are believed to represent the truth more nearly than do uncorrected yields.

Colonial plants.—Textile plants, H. Jumelle (*Les Cultures Coloniales.—Plantes Textiles. Paris: J. B. Baillière & Son, 1915, vol. 6, 2. ed., enl., pp. 118, figs. 33*).—This is part 6 of the second revised edition of the author's work (E. S. R., 33, p. 437), treating of kapok, cotton, coconut fiber, New Zealand hemp, Sansevieria, abacá, sisal hemp, agave, ramie, jute, hibiscus, and sann.

The curing of blue-grass seeds as affecting their viability, H. Garman and E. C. Vaughn (*Kentucky Sta. Bul. 198 (1916), pp. 27–39, pls. 5*).—Germination tests of blue-grass seeds subjected to different temperatures in the process of curing showed that seeds allowed to heat to 140° F. even for a short time are worthless, and that the seeds should never be permitted to heat above 122° F., as prolonged heating even at this temperature reduces the percentage of germination.

To show the influence of handling on the quality of the seeds, the following averages are given of germination percentages taken from records made in 1915; 12 tests of samples taken from bags at warehouses averaged 33.25 per cent; 18 samples from ricks at warehouses averaged 57.44 per cent; 12 samples from ricks in barns averaged 56.2 per cent; 10 samples from ricks out-of-doors

averaged 69.3 per cent; and 8 tests of hand-stripped samples averaged 73.62 per cent.

Observations by the authors led to the conclusion that the seeds are best when harvested in that locality from about June 15 to 20. Methods of harvesting and curing are described with a view to getting cleaner seed and higher viability.

Testing seed corn, C. G. Williams (*Mo. Bul. Ohio Sta., 1 (1916), No. 3, p. 96*).—The yields of corn for the years 1911–1915, inclusive, in an experiment at the Ohio Station averaged 54.49 bu. per acre from untested seed and 58.60 bu. from tested seed. It is pointed out that this increase of 4.11 bu. per acre at 50 cts. per bu. represents a return of $6.85 an hour for the time spent in testing.

The moisture content of 5 varieties of corn was determined early in November in 1908, 1914, and 1915, the average being 19, 26.6, and 33.5 per cent, respectively. Attention is called to the high moisture content of the 1915 crop and its relation to the percentage of germination.

Cotton experiments, 1915, H. B. Brown (*Mississippi Sta. Bul. 173 (1916), pp. 1–27, 29, figs. 3*).—This bulletin reports in part the results of cotton experiments conducted in 1915 at the Mississippi Station and the Holly Springs and Delta substations. Results of similar experiments have been previously reported (E. S. R., 32, p. 734). Temperature and rainfall records presented are regarded as showing practically no relation between cotton yields and rainfall and temperature fluctuations during the growing season.

A test of 21 varieties or strains at the station indicated the general superiority of Wanamaker-Cleveland, Cleveland Big Boll, and Hiller among the big boll varieties, although on rich bottom lands under boll-weevil conditions the smaller early-maturing varieties such as Trice and Dodds Prolific will possibly be more satisfactory. Express is regarded as ranking as a long-staple cotton for boll-weevil conditions and Unknown as comparing very favorably with Express.

Several varieties grown on silty loam land infested with cotton wilt were tested as to their resistance to the disease. Simpkins and Trice, known to be susceptible, were badly attacked while Dixie and Covington-Toole, resistant varieties, had practically no plants that showed external symptoms of the disease, and although a number of the plants were infected, their yield was not affected materially. Wanamaker-Cleveland, a variety of medium resistance which led in production per plant, is considered as possibly the best cotton obtainable when the crop must be grown under the conditions of the experiment.

Plats sprayed with a proprietary preparation to combat the boll weevil showed a total yield of seed cotton of 1,164 lbs. per acre for April plantings and 264 lbs. for June plantings, as compared with 1,176 and 256 lbs., respectively, for unsprayed plats.

The 6-year average yield of seed cotton per acre in a test of growing plants 1, 2, or 3 ft. apart in the drill was in favor of the 1-ft. distance with a yield of 1,643.5 lbs. The 5-year average yield of seed cotton per acre in a test of different distances between the rows was in favor of 3 ft., the smallest distance, with a yield of 1,446 lbs.

The results of the variety tests at Holly Springs, which are given in a table, indicated that Wanamaker-Cleveland, Cleveland Big Boll, Miller, and Triumph are among the leading varieties for the hill section of the State. Results of a variety test at Delta branch station are tabulated but no conclusions with reference to individual varieties are drawn. The variety averages for the three stations and the rank of varieties grown the last five years on the basis of money value per acre are also presented in tables.

Report on variety tests of cotton for 1915, R. Y. WINTERS and V. R. HERMAN (*Bul. N. C. Dept. Agr., 37 (1916), No. 2, pp. 3–15*).—On the station farm near Raleigh 37 short-staple varieties ranged in yield from 926 to 1,417 lbs. of seed cotton per acre, and 7 long-staple varieties from 976 to 1,297 lbs. of seed cotton per acre. In this test the highest yielding strains produced a shorter fiber. A comparison of five strains of Cleveland Big Boll and six strains of King showed that strains of the same variety may differ in character of plant, size of boll, shape of leaf, and yield.

In a test at Iredell farm of 21 short-staple varieties of cotton including the earliest medium boll and the small-boll varieties, the yields ranged from 370 to 1,261 lbs. of seed cotton per acre. The yields of the different varieties and strains are given in tables.

Japanese cane, J. M. SCOTT (*Florida Sta. Bul. 129 (1916), pp. 21–44, figs. 4*).—The culture and uses of Japanese cane are discussed, and the results of culture and fertilizer tests, together with analyses and other data as to the chemical composition of the crop with reference to its feeding and fertilizer value, are reported.

In the fertilizer experiments, conducted on 8 plats from 1909 to 1914, inclusive, 112 lbs. of dried blood, 72 lbs. of sulphate of ammonia, 84 lbs. of muriate of sulphate of potash, and 224 lbs. of acid phosphate per acre were used in different combinations. One plat received in addition in 1909, 1911, and 1913 an application of 2,000 lbs. per acre of ground limestone. The yields in tons of green material per acre in 1909 ranged from 16.10 on the plat receiving dried blood and acid phosphate to 27.03 on the plat receiving dried blood, sulphate of potash, acid phosphate, and ground limestone. The yields decreased greatly from the first to the sixth year and the averages ranged from 7.55 to 13.7 tons of green material per acre on the different plats. The results showed in general that on the soil on which the cane was grown potash was most beneficial, and nitrogen appeared to be next in importance. Ground limestone acted as a temporary stimulant and no results were apparent except from the first application. The method of fertilizing the soil had no effect on the percentage of sucrose in the juice.

A test of replanting cane on each of the 8 plats in 1915 gave yields of green material per acre ranging from 18 to 31.9 tons. It is believed that better yields of Japanese cane will be obtained by replanting every third or fourth year.

Sudan grass, C. G. WILLIAMS (*Mo. Bul. Ohio Sta., 1 (1916), No. 3, pp. 67–70, fig. 1*).—Notes are given on the seeding, harvesting, and feeding value of Sudan grass. The average yield of Sudan grass at the station for the years 1912–1914, inclusive, was 4.3 tons of dry hay per acre as compared with 3.9 tons of German millet.

Manurial experiments on sugar cane, 1912–1914, J. DE VERTEUIL (*Bul. Dept. Agr. Trinidad and Tobago, 13 (1914), No. 82, pp. 227–234, pl. 1, fig. 1*).—These experiments were conducted under the control of the Board of Agriculture on the Brechin Castle, Esperanza, and Malgretoute estates. On each estate, of the eight plats devoted to the work, the first four, constituting a nitrogen series, received a complete application, the fifth plat nitrogen and phosphates, the sixth nitrogen and potash, the seventh nitrogen alone, and the eighth was a control. Nitrogen was applied in all cases at the rate of 45 lbs. per acre, phosphates in the form of dissolved bone at the rate of 40 lbs., and potash in the form of the sulphate at the rate of 28 lbs. with the exception of plat 6 which received 40 lbs. In the nitrogen series, plat 1 received calcium nitrate, plat 2 sodium nitrate, plate 3 calcium cyanamid, and plat 4 sulphate of ammonia.

On the Brechin Castle estate plat 1, receiving the calcium nitrate, gave the largest profit, $3.11 per acre, but in no case was the increase resulting from fertilizer treatment sufficient to pay for the cost of the fertilizers. On the Esperanza estate the calcium nitrate plat was also the best, showing an increase of $8.30 in the value of the crop produced as compared with the control plat. All plats treated with sulphate of ammonia showed a loss. On the Malgretoute estate the results in no case showed an increase sufficient to pay for the cost of applying the fertilizers. At this place an additional plat which received an application of Peruvian guano at the rate of 3 cwt. per acre gave a profit of $11.04 per acre.

Manurial experiments on sugar cane, 1912–1915, J. DE VERTEUIL (*Bul. Dept. Agr. Trinidad and Tobago, 14 (1915), No. 5, pp. 145–155, pls. 3*).—This gives the results of an experiment to determine the value of different forms of nitrogen used on plant and first rattoon canes and continues the work noted above.

The greatest profit from first rattoons at the Brechin Castle estate was obtained from the plat receiving sulphate of ammonia and sulphate of potash, and the lowest return from the plat receiving nitrogen only in the form of sulphate of ammonia. The plat yielding the largest profit from the Esperanza estate was the one receiving sodium nitrate in connection with phosphoric acid and potash, while the least return was obtained from the plat receiving sulphate of ammonia and potash and that receiving sulphate of ammonia alone. The largest return from the Malgretoute estate was obtained by the use of calcium cyanamid with phosphoric acid and potash, and the smallest return from the plat receiving calcium nitrate with phosphoric acid and potash.

Proceedings of the Association of Official Seed Analysts of North America, 1914 (*Proc. Assoc. Off. Seed Anal. of No. Amer., 1914, pp. 32*).—A brief résumé of the development and activities of the association is given, together with the following papers presented at the seventh annual meeting (E. S. R., 32, p. 200): The Necessity for Standardization of Methods, by E. Brown; Uniform Methods of Sampling Seed, by E. D. Eddy; Apparatus and Methods Employed in Making Purity Tests of Seeds, by F. H. Hillman; The Enforcement of the New Jersey Seed Law, by J. P. Helyar; The Weed Content of Seeds, by A. L. Stone, which includes a table giving the number of seeds borne by 21 annual, 17 perennial, and 8 biennial weeds; and The Weed Content in Some Commercial Seeds, by L. H. Pammel and Charlotte M. King.

A paper on The Germination of Seeds Buried Ten Years, by W. L. Goss, points out that of 112 varieties 21, including only 4 weeds, never produced any sprouts after being buried; 69 produced sprouts after 10 years' burial; and the remainder perished during the interval. Of the 69 living at the end of 10 years 26 germinated 51 per cent or better, 13 between 25 and 50 per cent, 13 between 10 and 24 per cent, and 17 below 10 per cent. Attention is further called to the fact that green foxtail germinated 79 per cent at the end of 10 years. Broad leaved or bitter dock germinated 89 per cent in 10 years, black nightshade 90 per cent, burdock 93 per cent, jimson weed 95 per cent, ox-eye daisy 82 per cent, Canada thistle 21 per cent, and black mustard 25 per cent. The results of similar work by Duvel have been previously noted (E. S. R., 17, p. 556).

Results of seed inspection, 1914, J. P. HELYAR and R. SCHMIDT (*New Jersey Stas. Bul. 279 (1915), pp. 3–35*).—This bulletin tabulates the results of analysis of 443 unofficial samples and 455 official samples of seeds. The official samples included timothy, redtop, Kentucky and Canada blue grass, orchard grass, millet, meadow fescue, hard fescue, English rye grass, brome grass, red,

alsike, crimson, and white clover, alfalfa, and vetch. Comments are given on the official samples, and the methods of taking and sending samples to the seed laboratory are described. The text of the New Jersey seed law is included.

HORTICULTURE.

Subtropical vegetable gardening, P. H. Rolfs (*New York: The Macmillan Co., 1916, pp. XVIII+309, pls. 16*).—A practical treatise on vegetable growing in subtropical countries. Although the subject matter is based primarily on Florida practice, the author has also drawn on the results of horticultural investigators in this country as well as on the horticultural literature of tropical countries.

The first or general part of the work discusses soils and manures for vegetable gardening in warm countries, fertilizers, rotation of crops in vegetable gardening, water and watering, seeds and seed sowing, planting, pests and diseases, and marketing. The succeeding chapters take up the various classes of vegetables with reference to their specific cultural treatment. Short reference lists are given of publications dealing with the more important vegetables.

Vegetable culture, H. A. Van Hermann and R. S. Cunliffe (*Estac. Expt. Agron. Cuba Circ. 51 (1916), pp. 75, figs. 18*).—This circular discusses the general principles of vegetable growing, and gives specific directions for the culture of various kinds of vegetables adapted for culture in Cuba.

Cabbage, J. C. C. Price and G. V. Stelzenmuller (*Alabama Col. Sta. Bul. 187 (1916), pp. 3–20, figs. 2*).—This bulletin gives the results of fertilizer experiments and variety tests with cabbage conducted under the direction of the station, together with general directions for growing cabbage based upon the experiments, and including notes on insects and diseases.

Early peas tried at Wisley, 1915, C. C. Titchmarsh (*Jour. Roy. Hort. Soc., 41 (1915), No. 2, pp. 277–289, pl. 1*).—A report on varieties of garden peas under observation at Wisley in 1915.

Factors affecting regular bearing in orchards, J. E. Gourley (*Agr. Student, 22 (1916), No. 7, pp. 465–470, fig. 1*).—This article summarizes the results of experiments at the New Hampshire Experiment Station in plat tests of fruit trees with fertilizers, cultivation, mulching, liming, and cover crops; and of the effect of girdling and pollination, previously noted (E. S. R., 33, p. 44).

Bridge grafting of fruit trees, W. F. Fletcher (*U. S. Dept. Agr., Farmers' Bul. 710 (1916), pp. 8, figs. 7*).—In this publication the author discusses the range of usefulness of bridge grafting and gives detailed instructions for bridge grafting. Suggestions are also given for the prevention of injuries by mice, rabbits, and borers, together with a list of Department publications relating to animals and insects that are likely to girdle trees.

Pruning, W. H. Chandler and H. B. Knapp (*Cornell Reading Courses, 5 (1916), No. 104, pp. 73–96, figs. 27*).—A popular treatise on the methods of pruning various fruit trees and bushes.

Apple and pear growing, W. J. Allen (*Dept. Agr. N. S. Wales, Farmers' Bul. 92 (1915), pp. 74, pls. 2, figs. 49*).—A practical treatise on the establishment and management of apple and pear orchards, including descriptions of varieties. A section on insect pests of the apple and pear, by W. W. Froggatt and W. B. Gurney (pp. 27–47), is also given.

Grass mulch culture of apple orchards, F. H. Ballou (*Agr. Student, 22 (1916), No. 7, pp. 471–475, figs. 4*).—A popular summary of combined mulching and chemical fertilizer experiments in apple orchards being conducted at the Ohio Experiment Station.

As a result of these experiments it was found that by the judicious use of fertilizers on the thin orchard soils of the hilly sections of southeastern Ohio the vigor and fruitfulness of the trees is not only improved but the vegetation beneath the trees becomes transformed from a scanty wild growth of native weeds and poverty grass to an abundant growth of better grasses which, annually cut and allowed to remain as a soil covering, is rapidly proving a source of humus for the soil. No grass seed has been sown in any of these experiments.

The methods of propagation of the best varieties of perry pears, A. TRUELLE (*Les Modes de Propagation des Meilleures Variétés de Poiriers à Poiré. Argentan: Emile Langlois, 1915, pp. 11*).—In addition to a discussion of methods of propagation, a list is given of some 84 varieties of cider pears of French and of foreign origin, together with a selected list of 15 of the more important varieties, which includes analytical data showing the principal elements contained in a liter of juice of these varieties.

Report on the cooperative fertilizer experiments with cranberries at Whitesbog, Browns Mills, New Jersey, 1915, F. P. SCHLATTER (*Proc. Amer. Cranberry Growers' Assoc., 46 (1916), pp. 9–13, 15–19*).—A general summary is given of the results secured in 1915 in the cooperative fertilizer experiments with cranberries being conducted under the direction of the New Jersey Experiment Stations (E. S. R., 34, p. 150). The data secured from various plats are presented in tabular form and discussed.

Although no definite conclusions are drawn at this time, the results of the work for the three seasons show that fertilizers have given an increased yield in only one series of experiments, where the plats were located on a sandy soil. In one series, which is located on deep mud or muck bottom soil, fertilizers, excepting perhaps phosphorus-containing materials, have had a detrimental effect. Practically the same results were secured in a series of experiments conducted on a deep mud soil underlaid with bog iron ore.

The resistance of various gooseberry varieties against North American gooseberry mildew and their behavior on treatment with sulphur, G. KÖCK (*Die Widerstandsfähigkeit verschiedener Stachelbeersorten gegenüber nordamerikanischem Stachelbeermehltau und ihr Verhalten bei der Behandlung mit Schwefel. Vienna: K. K. Pflanzenschutzstation [1914], pp. 4*).—The author enumerates some 100 varieties of gooseberries under observation and gives further lists of those which were subject to mildew attack and those which suffer from leaf fall upon being treated with sulphur.

Strawberry culture, F. W. JIMENEZ (*El Cultivo de la Fresa. Mexico: Govt., 1914, rev. and enl., pp. 27*).—A popular treatise on strawberry culture with special reference to Mexican conditions.

Note on some determinations on the grapes of French-American and American hybrid vines, F. C. TORNELLO (*Agr. Mod. [Milan], 22 (1916), No. 3, pp. 26–28*).—The author reports observations made on vines of six hybrid species, conducted in the antiphylloxera nursery at Cerignola. The data given show the yield of the different species, quality of the fruit, and relative proportion of the juice, must, and residue, as well as the sugar, acid, and alcoholic content of the must.

Muscadine grapes, G. C. HUSMANN and C. DEARING (*U. S. Dept. Agr., Farmers' Bul. 709 (1916), pp. 28, figs. 29*).—A treatise on the Muscadine grapes with reference to their botanical relation and classification, propagation, soils, planting, companion crops, cultivation, fertilization, pollination, pruning and training, harvesting and handling, yields and returns, uses, insect enemies and diseases, breeding investigations, and general descriptions of the leading varieties.

As a result of the breeding investigations already conducted by the Department some valuable seedlings have been secured. One lot of 49 seedlings has been produced in which over 50 per cent are perfect flowered and self-fertile, there being no sterile male seedling in this lot. The progress thus far made with this lot suggests that it is only a matter of time when self-fertile varieties with greater yields than the present varieties will be produced. A number of promising hybrids between Muscadine and American Euvitis and between Muscadine and Vinifera grapes have also been produced.

The raisin industry, G. C. HUSMANN (*U. S. Dept. Agr. Bul. 349 (1916), pp. 15, pls. 9, figs. 3*).—An account of the raisin industry in the United States, in which consideration is given to the origin, growth, and fluctuations in the industry, soils adapted for raisins, preparation of soils, pruning methods, raisin varieties, climatic conditions, harvesting and preparing the crop, dipping and scalding raisins, packing raisins, and classes of raisins.

[Varieties of the avocado], F. O. POPENOE (*Cal. Citrogr., 1 (1915), No. 3, pp. 14, 33; 1 (1916), Nos. 4, pp. 12, 13, 24, figs. 3; 5, pp. 8–10, figs. 4*).—An exposition on the varieties of the avocado, including a descriptive list of the varieties which was prepared for the California Avocado Association.

Study on the chayote (Sechium edule), D. A. HERRERA (*Bol. Dir. Gen. Agr. [Mexico], 5 (1915), No. 2, pp. 135–143*).—In this article the author discusses the chayote with reference to its botany, chemical composition, culture, and uses.

Features of the grapefruit in California, A. D. SHAMEL (*Cal. Citrogr., 1 (1916), Nos. 5, pp. 19, 20, figs. 2; 6, pp. 3, 13, fig. 1*).—A paper on this subject in which the author reviews the grapefruit situation in California. Information is given relative to varieties, distribution of plantings, relation of composition and other characteristics to the quality, comparative analyses of Florida and California grapefruit, and analyses of representative types of California-grown Marsh Seedless grapefruit during the ripe period.

The consumer's dollar working backwards, G. H. POWELL (*Ann. Conv. Nat. League Com. Merchants U. S., 24 (1916), pp. 80–91, figs. 5*).—An economic discussion of the methods and cost of distributing citrus fruit, with special reference to the California citrus fruit crop.

Seed gardens (*Dept. Landb., Nijv. en Handel [Dutch East Indies], Meded. Proefstat. Thee, No. 39 (1915), pp. 24, pls. 3*).—This pamphlet contains the following articles: Report on a Study of the Tea Seed Gardens in Cachar and Sylhet, by A. S. Tunstall, translated by C. Bernard (pp. 1–14), and Some Observations on Tea Gardens in Java, by C. Bernard (pp. 15–24). These articles contain information relative to the care and management of the tea seed gardens with special reference to the pruning and training of seed trees and insect pests and diseases and their control.

Fertilizer experiments at Malabar, II, K. A. R. BOSSCHA (*Dept. Landb., Nijv. en Handel [Dutch East Indies], Meded. Proefstat. Thee, No. 37 (1915), pp. 13*).—A further report on fertilizer experiments with tea plants conducted at Malabar (E. S. R., 32, p. 46). A brief note on the productive possibilities of the tea plant, by A. E. Reijnst (pp. 11–13), is also included.

The production and commerce of nuts in Asia, M. and L. RIGOTARD (*Vie Agr. et Rurale, 6 (1916), No. 10, pp. 175–178, figs. 2*).—This article is essentially a comparative study of French and Asiatic varieties of walnuts with special reference to their commercial importance.

Experiments in forcing the lily-of-the-valley by means of the warm water process, G. A. LANGER (*Möller's Deut. Gärt. Ztg., 30 (1915), No. 50, pp. 398–401, figs. 7*).—In 1914 experiments were conducted with a large number of lily-of-the-valley plants which were treated by the warm bath process (E. S. R.,

27, p. 842), the various temperatures ranging from 25 to 45° C. (77 to 113° F.), and for 5- and 10-hour periods. The warm water bath was applied to some lots of plants as early as November 25 and to others as late as February 22.

Summing up the data secured from the various tests, the author finds that the advantage of the warm water process for early forcing has been proved beyond doubt. The temperature of the water and the duration of the bath varies with the time the plants are to be forced. For early forcing the temperature should range from 35 to 38° and the bath should be continued for a 10-hour period, or with a temperature of 40° an immersion period of only 4 or 5 hours is necessary. Later in the season the temperature may be reduced from 32 to 35° and the immersion period continued for about 5 hours. In the present experiments the warm water bath applied after the middle of February appeared to be not only superfluous but to do some damage.

Generally speaking, it is not necessary to immerse the plants for as long a time after a wet or cold summer as after a dry and warm summer. Plants from heavy soils are more susceptible to treatment than plants from light sandy soils, and large plants react more favorably than small plants. In all cases it is necessary to maintain the water at the proper temperature throughout the time of the bath.

[Phloxes and pyrethrums at Wisley, 1915], C. C. Titchmarsh (*Jour. Roy. Hort. Soc., 41 (1915), No. 2, pp. 250–276*).—This comprises a report on several hundred varieties of phlox and pyrethrums under observation at the Wisley Gardens during 1915.

House and window plants, D. Bois (*Les Plantes d'Appartement et les Plantes de Fenêtres. Paris: J. B. Baillière & Sons, 1916, 2. ed., rev. and enl., pp. 443, figs. 219*).—Part 1 of this work deals with the general principles of culture as applied to house and window plants. Part 2 contains a descriptive list of plants suitable for windows and balconies, including specific cultural directions, and part 3 takes up in a similar manner the plants suitable for culture in the house. Part 4 contains classified lists of the plants, with special reference to their light requirements and value for foliage, flowers, and decorative purposes.

Fertilizing lawn and garden soils, P. E. Brown (*Iowa Sta. Circ. 24 (1916), pp. 3–15*).—This circular discusses the preparation of lawn soils, fertilization, seeding, subsequent fertilization, and renovating lawns. Information is also given relative to the use of fertilizers and green manure crops for the vegetable garden.

The North Dakota farmstead, its arrangement and adornment, H. O. Werner (*North Dakota Sta. Circ. 10 (1916), pp. 62, figs. 51*).—In this circular the author discusses the location of the farmstead site and the arrangement of farm buildings and grounds, together with the development of the farmstead from an ornamental point of view. A descriptive list is given of trees, shrubs, vines, hardy perennials, and annual plants suited for North Dakota conditions, together with detail plans of farmsteads with lists of plant materials suggested. Directions are also given for the culture and care of trees and shrubs.

Gardeners' and florists' annual for 1916, edited by J. H. Dick (*New York: A. T. De La Mare Printing & Publishing Co., Ltd., 1916, pp. 231, figs. 21*).—This work contains a digest of the events of the horticultural year in this country and abroad, including the activities of the national societies, a summary of law cases affecting the trade, biographies of leading horticulturists, special articles, and miscellaneous notes and information dealing with gardening and floriculture.

FORESTRY.

Laws, decisions, and opinions applicable to the National Forests, compiled by R. F. Feagans (*U. S. Dept. Agr., Office Solicitor, Laws, Decisions, and Opinions Applicable to the National Forests, 1916, pp. 151*).—This comprises a compilation of laws and parts of laws of a general nature affecting the administration and protection of the National Forests, with citations to acts of special or local application, and references to the more important decisions of the courts, the Interior Department, the Attorney General, the Comptroller of the Treasury, and the Solicitor of the Department of Agriculture.

Seventh annual report of the state forester.—Forestry in Vermont, A. F. Hawes (*Ann. Rpt. State Forester Vt., 7 (1915), pp. 55, pls. 6*).—This report includes a description of some of the more interesting examples of forestry throughout the State, together with an account of nursery planting operations for the year and activities on the different State forests. A brief note is given on white pine blister rust inspection for 1915. A report on forest fires in 1914 by R. M. Ross and a report on an examination made by B. A. Chandler on land willed to the United States Government are also included.

Eighth annual report of the Washington Forest Fire Association, 1915 (*Ann. Rpt. Wash. Forest Fire Assoc., 8 (1915), pp. 20*).—A report of the activities of the association for the year 1915 in the protection of some 2,586,409 acres of forests from fire.

Report of committee on forestry, Hawaiian Sugar Planters' Association, for the year ended September 30, 1915, L. A. Thurston (*Honolulu: Hawaiian Gazette Co., Ltd., 1915, pp. 22*).—This report contains short reports by C. S. Judd (pp. 6–14), D. Forbes (pp. 15–20), and L. von Tempsky (pp. 21, 22), in which consideration is given to the desirability of forest protection and forest extension for the conservation of water and the protection of watersheds, the prevention of sand or dust drifting, and the production of the major and minor forest products. Lists are given of trees suitable for these various purposes in Hawaii.

The Eberswalde forest-seed testing station and the methods of testing the seeds, Schwappach (*Ztschr. Forst u. Jagdw., 47 (1915), No 11, pp. 631–651, fig. 1*).—A descriptive account of the seed-testing work of the Eberswalde seed-testing station.

Progress report of forest administration in Baluchistan for 1914–15, Mulraj (*Rpt. Forest Admin. Baluchistan, 1914–15, pp. 6+II+28*).—The usual progress report of the administration of the state forests of Baluchistan, including data relative to alterations in areas, forest surveys, working plans, forest protection, revenues and expenditures, etc., for the year 1914–15.

Annual progress report on forest administration in the Province of Bihar and Orissa for the year 1914–15, H. H. Haines (*Ann. Rpt. Forest Admin. Bihar and Orissa, 1914–15, pp. II+52+5*).—A report similar to the above relative to the administration of the state forests of the Province of Bihar and Orissa for the year 1914–15.

Annual administration report of the forest department of the Madras Presidency for the twelve months ended June 30, 1915, A. W. Lushington, S. Cox, P. M. Lushington, C. D. McCarthy, et al. (*Ann. Admin. Rpt. Forest Dept. Madras, 1915, pp. 81+LXXII+18*).—This comprises separate reports on the administration of the state forests in the Northern, Central, Southern, and Western Circles of the Madras Presidency, together with a summarized report on the administration of the forests in the Presidency as a whole. Data relative to alterations in forest areas, forest surveys, protective and miscellaneous

work, yields in major and minor forest products, revenues, expenditures, etc., are included in tabular form.

Progress report on forest administration in the Northwest Frontier Province for the year 1914–15, W. MAYES (*Rpt. Forest Admin. Northwest Frontier Prov., 1914–15, pp. 4+II+14+XXIV*).—A report similar to the above relative to the administration of the state forests of the Northwest Frontier Province for the year 1914–15.

Report of the department of forestry for the year ended June 30, 1915, R. DALRYMPLE-HAY (*Rpt. Forestry Dept. N. S. Wales, 1915, pp. 6, pls. 6*).—This is the usual progress report relative to the administration and management of the state forests and forest nurseries of New South Wales, including information relative to afforestation work, alterations in forest areas, imports and exports of timber, revenues, expenditures, etc.

The native and cultivated forest trees and shrubs of the Missouri River basin, L. H. PAMMEL, G. B. MACDONALD, and H. B. CLARK (*Proc. Iowa Acad. Sci., 22 (1915), pp. 23–56, pls. 12*).—In this paper the authors present a catalogue of trees and shrubs of the Missouri River basin in western Iowa and eastern Nebraska. Introductory considerations deal with the topography and soils of the region, the range and ecological distribution of trees in the area surveyed, and the origin of the tree flora.

A mill scale study of western yellow pine, H. E. MCKENZIE (*Cal. Bd. Forestry Bul. 6 (1915), pp. 171, figs. 222*).—The study here reported is based upon 919 trees ranging from 20 to 44 in. in diameter breast-high. A complete analysis of the quality and quantity of lumber produced from these trees, also from the butt logs (the best part) and the top logs (the poorest part of the trees) was made. The measurements secured in this work are here presented, together with deductions made therefrom, in a series of curves and tables with a view to throwing some light on the lumbering value and the best time to cut trees of various sizes.

Colonial plants.—Latex and resin yielding plants, H. JUMELLE (*Les Cultures Coloniales.—Plantes a Latex et a Résines. Paris: J. B. Baillière & Sons, 2. rev. ed., vol. 7, 1915, pp. 119, figs. 41*).—This is part 7 of the author's revised work (see p. 829). The present part discusses various rubber and resin yielding plants with reference to their botany, exploitation, culture, and utilization.

[Papers on rubber culture and the rubber industry] (*Introductory Papers Internat. Rubber Cong. Batavia, 1914, pp. [191], fig. 1*).—This comprises some 21 papers on various phases of rubber culture and the rubber industry, which were prepared for the International Rubber Congress and Exhibition at Batavia in September, 1914. Certain of the present papers are classed as introductory papers and others as papers prepared for but not included in the rubber book issued by the congress (E. S. R., 33, p. 50).

Manurial experiments with young rubber at Kuala Lumpur, F. G. SPRING (*Agr. Bul. Fed. Malay States, 4 (1916), No. 4, pp. 105–110*).—Data are given on the fourth season's results with various combinations of lime, nitrogen, phosphorus, and potash (E. S. R., 32, p. 339).

The fertilizers in this experiment were applied at the beginning of the first and third years. They appeared to have had a stimulating effect as regards growth for about a year after each application. After this there seemed to be a slight reaction as compared with the control plats. Over the whole 4-year period the total increase in the manured plats in every case exceeded that of the controls. No definite conclusions are to be drawn until the trees are tapped.

The natural reproduction of sal, R. S. Troup (*Indian Forester, 42 (1916), No. 2, pp. 57–60*).—Experiments conducted by the author show that in the open, exposed to the sun, the seed of sal (*Shorea robusta*) falling on a layer of dead leaves fails to germinate or, if it does germinate, perishes rapidly. Under shade with complete protection from the sun the seed falling on a layer of dead leaves germinates and the seedlings develop satisfactorily above ground during the first rainy season. Relative to the root system, however, unless the leaf layer is so scanty as to permit of the ready penetration of the taproot to the mineral soil, the roots spread horizontally along the moist leaves and perish in the ensuing dry season. These results suggest that the annual layer of fresh dead leaves may be a highly adverse factor so far as natural reproduction is concerned.

Anatomical investigations on the formation of annual rings of Tectona grandis, F. Geiger (*Jahrb. Wiss. Bot. [Pringsheim], 55 (1915), No. 4, pp. 521–607, figs. 28*).—A study of annual ring formation of teak woods secured from different sections of east and west Java. Data are given and discussed showing the variation in the formation and distribution of the elementary organs in the different specimens, with special reference to structure in the region of growth.

A bibliography of related literature is appended.

Reproduction of teak by root suckers, E. Marsden (*Indian Forester, 42 (1916), No. 2, pp. 43–50, pls. 6*).—Experiments reported by the author indicate that the so-called root suckers of teak are really "stool shoots" and that true root suckers are comparatively rare, these being usually confined to a few shoots which originate near the head of the roots, close to the parent stem.

Teak working plans in Burma, H. W. A. Watson (*Indian Forester, 42 (1916), No. 1, pp. 4–17*).—In this article the author discusses the past working plans and the probable trend of future working plans, including suggestions for their development.

An investigation relative to the most exact method of measuring teak trees and teak stands, H. Beekman (*Dept. Landb., Nijv. en Handel [Dutch East Indies], Meded. Proefstat. Boschw., No. 1 (1915), pp. VIII+93, pls. 20*).—This comprises a report on a comparative study of methods of estimating age, diameter, height, and volume growth, with special reference to teak trees and teak forests. The data secured are presented in a series of diagrams and tables and fully discussed.

The care and improvement of the woodlot, C. R. Tillotson (*U. S. Dept. Agr. Farmers' Bul. 711 (1916), pp. 24, figs. 6*).—This bulletin discusses the essentials of a good woodlot and its improvement, care, and methods of regeneration.

Marketing of woodlot products in Kentucky, W. D. Sterrett (*Bien. Rpt. State Forester Ky., 2 (1915), pp. 71–140, pls. 24*).—In this paper the author briefly surveys the woodlot situation in Kentucky; gives an account of the woodlot regions, wood-using industries, and how the different species are used; and discusses the methods of increasing the profits from woodlot sales and of preventing the deterioration of cut woodlot products. A directory of wood-using firms is included.

Utilization of southern wood waste, A. D. Little (*Chem. Engin., 23 (1916), No. 2, pp. 83–86*).—An address on this subject delivered before the eighth annual meeting of the American Institute of Chemical Engineers in January, 1916, in which the author gives special attention to the various methods of utilizing wood waste in longleaf yellow pine.

Wood flour, F. W. Kressmann (*Metallurg. and Chem. Engin., 14 (1916), No. 7, pp. 372–374*).—A discussion of the nature, properties, and uses of wood flour.

DISEASES OF PLANTS.

The International Phytopathological Convention of Rome and its relation to tropical agriculture, A. G. L. ROGERS (*Proc. Internat. Cong. Trop. Agr., 3 (1914), pp. 109–117*).—A brief abstract is given of this paper, which dealt with the history of the movement in favor of international action for control of plant diseases, the congress at Rome in 1914, the inadequate representation of tropical countries, a summary of legislation and regulations at present in force in tropical and subtropical countries, a comparison of these regulations with those contemplated by the Rome convention, and the advantages and disadvantages of the proposed change of method. The discussion which followed the paper is also reported.

Vegetable pathology, D. BOIS (*Rev. Hort. [Paris], 87 (1915), No. 19, pp. 404, 405*).—The author describes briefly the organization of the Société de Pathologie Végétale, which held its first meeting in Paris in February, 1914, listing the officials chosen thereby and noting the main contents of its first bulletin.

[Effect of meteorological conditions on development of plant diseases], G. DOROGIN (*Mat. Mikol. i Fitopatol. Ross., 1 (1915), No. 2, pp. 3–9, fig. 1*).—It is announced by the author that hereafter the Bureau of Mycology and Phytopathology of the Russian Department of Agriculture will make a special study of the meteorological conditions of the Petrograd region in their relation to the development of plant diseases. In order to secure accurate data this study will extend over a period of many years. Tables showing cloudiness, rainfall, depth of snow layer, soil and atmospheric temperature, atmospheric pressure, reiteration and strength of winds, and certain other factors will be compiled quarterly and published in this journal. The first table, covering the winter months of 1914–15, is given with this article.

The genus Fusarium in plant pathology, G. GANDARA (*Mem. y Rev. Soc. Cient. "Antonio Alzate," 32 (1913), No. 9–10, pp. 415–426*).—The author gives the results of an examination attempting to determine the really pathological species of Fusarium so far as plants are concerned, the known synonymy of the same, and the hosts attacked by preference in each case.

An Asiatic species of Gymnosporangium established in Oregon, H. S. JACKSON (*U. S. Dept. Agr., Jour. Agr. Research, 5 (1916), No. 22, pp. 1003–1010, pls. 2*).—A detailed account is given of investigations conducted by the author, while connected with the Oregon Experiment Station, on *G. koreænse*, a preliminary note of which has already been given (E. S. R., 34, p. 352).

Pyrenochæta elodeæ n. sp., V. ORSHANSKAIA (*Mat. Mikol. i Fitopatol. Ross., 1 (1915), No. 2, pp. 35–37, figs. 2*).—The above species was isolated by the author from *Elodea densa*, the leaves and stems of which were affected by this parasite and turned yellowish instead of normal bright green. The host tissue was found to be permeated with the fungus mycelium, which was also growing in flakes on the surface of the plant. A technical description of the fungus is given.

Rhizoctonia crocorum and R. solani (Corticium vagum), with notes on other species, B. M. DUGGAR (*Ann. Missouri Bot. Gard., 2 (1915), No. 3, pp. 403–458, figs. 9*).—The author presents an account of investigations on Rhizoctonia as a cause of disease in plants, especially of those carried out since the appearance of his own earlier work with Stewart (E. S. R., 13, p. 55).

The view that the Rhizoctonia forms on crocus, alfalfa, and some other hosts belong to a single morphological species is confirmed. The correct name of the violet root fungus, so long as a spore stage remains uncertain, is held to be *R. crocorum*. This is known in a few localities in America and widely in

Europe. It attacks plants in many families, but mainly dicotyledons. Large sclerotia are observable in connection with crocus and alfalfa. The existence of distinct forms or races of this species requires further investigation. The organism has not yet proved to be culturable by the usual laboratory methods, and the evidence collected is still insufficient to identify the perfect form.

R. solani, which is readily distinguishable from the above, is said to be widely distributed in America and elsewhere on potato. The other host plants represent many families, *Asparagus sprengeri* being the only monocotyledonous host yet reported. The types of disease caused by this species are very diverse, damping off and root and stem rots being the most important direct effects. The organism is readily culturable by the usual laboratory methods. The perfect stage is thought to be *C. vagum*.

Contrasted descriptions are given of these two fungi, with notes on other species, some of which are considered as having insufficient affinities to be included in the genus Rhizoctonia.

A bibliography is appended.

Notes on plant parasitic nematodes, L. P. BYARS (*Abs. in Science, n. ser., 43 (1916), No. 1102, p. 219*).—Attention is called to the general characteristics of nematodes and to the economic importance and present distribution of the bulb and stem infesting nematode, *Tylenchus dipsaci; T. tritici*, a parasite of wheat kernels; *Aphelenchus armerodis*, a violet bud organism; and *Heterodera radicicola*, a gall-forming nematode on a number of plants.

[Plant diseases in Barbados], J. S. DASH (*Rpt. Dept. Agr. Barbados, 1913–14, pp. 43–45*).—It is stated that *Colletotrichum falcatum*, the cause of sugar cane red rot, was rarely met with during 1913–14, but *Marasmius sacchari*, the cause of a root disease of cane, appeared as usual. *Thielaviopsis ethacceticus*, which attacks cane cuttings principally, was severe in several places. It can be controlled, it is said, by passing the cuttings through Bordeaux mixture just before planting.

A banana disease may be connected with the presence of a Fusarium and a Glœosporium on the diseased portions. Insufficient nutrition and inferior living conditions generally may render the trees susceptible to these fungi.

Specimens of dieased tomato showed two diseases, one a leaf mold (*Cladosporium fulvum*), the other a fruit anthracnose due to a Glœosporium.

Grape mildew (*Oïdium tuckeri, Uncinula spiralis*) was successfully treated with flowers of sulphur and lime in the form of a powder.

A dieback of cassava, ascribed to a Glœosporium (possibly *G. manihot*), may be controlled, it is thought, by care in the selection of cuttings and soaking them in Bordeaux mixture just before planting.

Eutypa erumpens is said to have caused a loss of *Ficus nitida*.

Cultivated snapdragon (*Antirrhinum* sp.) showed evidences of a disease of the roots and of the stem near the ground, from the fructifications of which a Colletotrichum could be developed. This is said to be somewhat different from *C. antirrhini* described by Stewart (E. S. R., 12, p. 1055) as causing anthracnose of snapdragon. Use of seed for propagation is advised.

[Plant pests and diseases in Grenada], J. C. MOORE (*Imp. Dept. Agr. West Indies, Rpt. Agr. Dept. Grenada, 1914–15, pp. 7, 8, 19*).—A report of Ballou and Nowell, besides giving information regarding animal pests, records the discovery of root diseases due to three species of Rosellinia. Two of these were found attacking cacao, one in wet, the other in drier situations. The third form, *R. bunodes*, was observed on hibiscus in the interior of the island.

In another part of the report, brief notes are given on thread blight of cacao and nutmegs, also canker, pod brown rot, and dieback of cacao.

[Work of the Bureau of Mycology and Phytopathology], A. Iachevskiĭ (Jaczewski) (*Mat. Mikol. i Fitopatol. Ross., 1 (1915), No. 2, pp. 48–52*).—This is a general outline of the main problems on which the members of the bureau staff are working at the present time.

Of particular interest is a peculiar disease of cereals known in Russia as "drunk bread." This is attributed to the action of certain fungi, and results in general intoxication of the population when affected grains are used for food. The disease occurs from year to year in eastern Siberia and also occasionally in northern and central European Russia. Pathological as well as chemical investigations are under way, and preliminary reports are already in print.

Rusts are considered another serious pest of cereals. Work along this line is concentrated chiefly on selecting and breeding disease resistant varieties. Results of the previous two seasons' work will soon be published.

In regard to smuts, attention is directed toward simplifying and improving various methods of seed treatment. Contrary to the opinion of some practical men, the exposure of smut spores to a temperature of from 20 to 24° C. for a long time did not affect their ability to germinate.

Club root of cabbage is said to cause immense losses, especially in suburban gardens of Petrogad. A thorough study was made during the past three years on the life history of the causal organisms, means of infection, host relations, and means of control.

Much attention has been devoted to testing various fungicides, and the results of the experiments are fully in favor of lime and sulphur compounds as substitutes for Bordeaux mixture and other mixtures of copper salts. Root gall of nursery stock, American gooseberry mildew, and fungus diseases of insects are the remaining three problems mentioned in the outline.

An investigation of the mycological flora in Astrakhan, S. Shembel (*Mat. Mikol. i Fitopatol. Ross., 1 (1915), No. 1, pp. 7–41, figs. 23*).—The author gives an account of fungus diseases observed during the summer of 1913 in the Province of Astrakhan, Russia, chiefly in the vicinity of the city of Astrakhan.

The number of cryptogamic parasites in that particular season was not very great, but the area affected and the degree of infestation were quite serious. Most prevalent appeared to be members of the family Erysiphaceæ, frequently attacked by a parasite of the genus Cicinnobolus, and various rust fungi. Among the latter is mentioned *Uromyces alhaginis* n. sp. on leaves and stems of *Alhagi camelorum*. On the same host the author found also an undescribed species of Septoria which he named *S. alhaginis*, and another new fungus on *Euphorbia esula* named *Leptothyrium caspicum* n. sp.

Grapes suffered more than any other cultivated plant, due to a severe attack of mildew (*Plasmopara viticola*), from 50 to 70 per cent of the fruit being affected. Spraying with Bordeaux mixture before the blossoming period gave almost perfect control of this disease, while omission of this spray resulted in the loss of the largest part of the crop. Two applications of Lazurin (a prepared Bordeaux mixture) on May 23 and July 3 at the rate of about 4½ lbs. to 21½ gal. water, with the addition of the dusting of the blossoms with sulphur, practically freed the plants from the fungus. In the same experiment, polysulphids and insecticides alone did not check the development of the disease.

[Report of the plant pathologist], I. E. Barbarin (*Otchet Mikol. Kab. Salgirsk. Opytn. Plod. Sta., 1913–14, pp. 14*).—A brief account is given of the work carried on at the Salgir Experiment Station since its organization in 1913. The diseases studied included a supposedly nonparasitic spot of apple fruit known in Germany as Stippigkeit; the so-called dry spot of apple leaves; pink

spot of watermelons due to *Glœosporium lagenarium*, which is very widely spread in the Crimea; and wheat rust caused by *Puccinia glumarum*, with particular reference to the possibility of its transmission with the seed.

In testing various fungicides, it was found that a proprietary compound known as Mortus was most effective against apple scab and American gooseberry mildew (*Sphærotheca mors-uvæ*). The composition of Mortus is unknown, but chemical analysis showed the presence of sodium and arsenic, and some evidence was obtained that the effectiveness of the compound is due to the latter element. Laboratory tests with germinating spores of *Monilia fructigena, S. humuli, Trichothecium roseum, Penicillium* sp., and others showed that germination was retarded in a solution of ½ gm. sodium arsenite in 3 liters of water, and that it ceased entirely in a solution of twice this strength. More extended experiments are to be carried on in the future.

Observations on parasitic fungi in the Province of Podolsk, M. E. Dobrovol'skiĭ (*Zhur. Bolíezni Rast., No. 4–5 (1914), p. 139; abs. in Mat. Mikol. i Fitopatol. Ross., 1 (1915), No. 1, pp. 74, 75*).—Among the fungi collected by the author in the Province of Podolsk in 1912, some are reported on new hosts, among which are *Tilletia controversa* on *Triticum vulgare*, *Venturia inæqualis* on *Pyrus prunifolia*, and *Rhytisma punctatum* on *Acer ginnale*. The author also describes *Ascochyta cardiacæ* n. sp. from *Leonurus cardiaca*.

[Report on plant diseases], F. A. Stockdale (In *Summary of Investigations Made During the Period January 1 to June 30, 1915. Mauritius: Dept. Agr., 1915, pp. 1, 2*).—Three manifestations are described from different localities of what appears to be a physiological disease resulting in the production of a gummy substance in the tissues of the sugar cane plant. The leaf and stem disease of cassava due to *Glœosporium manihotis* has again been prevalent in some sections, local varieties suffering more than those recently introduced. The local variety of pistachio appears to be more resistant than imported ones to a leaf spotting disease caused by a species of Cercospora.

Phytophthora infestans was common on potatoes and tomatoes in some localities late in June. Its control, where dews are heavy, appears to be more difficult in this region than in Europe. Attempts are being made to hybridize locally resistant varieties with standard European varieties of tomatoes.

Duration of resistance of plants and insects to hot water (*Rev. Sci. [Paris], 53 (1915), I–II, No. 17, pp. 405, 406*).—In connection with the mention of tests on the resistance of insects to hot water in view of the present high price of chemicals, it is said to have been found by Gaston and Vermorel that grapevines were uninjured by a hot water temperature of 45° C. (113° F.), but that young leaves were killed by a temperature of 50° in 6 minutes and 52° in 1 minute.

Burgundy mixture as a substitute for Bordeaux mixture, W. Nowell (*Agr. News [Barbados], 14 (1915), No. 355, p. 398*).—The difficulty experienced in securing quicklime for Bordeaux mixture in some of the West Indies having resulted in the employment of slaked or partly slaked lime in this application and in the preparation therefrom of an inferior spray for fungicidal purposes, attention has been directed to Burgundy mixture. This is said to have yielded excellent results in experiments referred to, showing advantages even where good lime is available. Several formulas are given, with directions for mixing and testing.

Fungicide experiments, 1914, G. P. Darnell-Smith (*Agr. Gaz. N. S. Wales, 26 (1915), No. 6, pp. 494, 495*).—The results of these and previous experiments are claimed to show that the safest treatment thus far tested, as regards germinability and freedom from bunt, is immersion of the seed wheat for three minutes in 1.5 per cent copper sulphate solution and then for an equal period in lime water.

[Potassium permanganate treatment for seed grains], K. L. ÉGERT (*Selsk. Khoz., 1914, pp. 1343–1346; abs. in Mat. Mikol. i Fitopatol. Ross., 1 (1915), No. 2, p. 66*).—The author obtained a perfect control of wheat smut by soaking seed ½ hour in potassium permanganate solution at the rate of about ½ oz. to 3 gal. of water. A solution practically 10 times stronger than this did not affect the germinating power of the grain. This treatment, according to the author, is less expensive than the usual formalin method, and, besides, the seed thus treated is not attractive to birds on account of a black color which it takes on in soaking.

Blight in maize (*Agr. Gaz. N. S. Wales, 26 (1915), No. 5, p. 388*).—Reports sent in by officials are said to indicate that a leaf blight of maize, due to a Helminthosporium, causes severe loss in localities where heavy rainfall and hot steamy weather continue for some time. The trouble is apparently augmented by the continuous growing of maize on the same land year after year. Rotation and the use of leguminous crops for green manuring are recommended.

Flower-bud and boll shedding of cotton in the Ilorin Province, Nigeria, T. THORNTON (*Proc. Internat. Cong. Trop. Agr., 3 (1914), pp. 331–335*).—This is an abstract of an account, with discussion, of observations made on both exotic and native cotton as regards one of the most serious drawbacks to its cultivation in that section.

High relative humidity, cloudy weather, and rain usually produced very severe losses. During the wet period the buds and bolls only were dropped, but not long after the establishment of the dry season an increased shedding of these was accompanied with a loss of leaves. Partial recovery later usually resulted in the production of new leaves and blooms, and a little rain falling in this period may result in a fair crop.

Helminthosporium turcicum, I. ZHAVORONKOVA (*Mat. Mikol. i Fitopatol. Ross., 1 (1915), No. 1, pp. 42–50, figs. 7*).—This is an account of studies upon the effects of various culture media and temperatures on the growth of this organism, which the author isolated from diseased maize leaves.

The cultures were started in Van Tieghem moist cells and then transferred to nutrient media. The best growth was obtained on grains of maize and rice, and especially on bread. Gelatin appeared to be completely liquefied after three weeks. In regard to the temperature, growth began one or two days earlier and the mycelium developed more luxuriantly and densely at 25 to 30° C. than at 15 to 16°.

Crown gall of mangels (*Field Expts. Harper-Adams Agr. Col. and Staffordshire, Rpt. 1914, p. 31, pl. 1*).—Several specimens of roots showing crown gall due to *Bacterium tumefaciens* have been received from Warwickshire and Shropshire. The disease is said to be increasing in importance, as numerous kinds of plants are attacked, including beet, potato, hop, tobacco, apple, and most other fruit trees, roses, and chrysanthemums.

Wart disease, G. T. MALTHOUSE (*Field Expts. Harper-Adams Agr. Col. and Staffordshire, Rpt. 1914, pp. 27–29, pl. 1*).—A report is given of the 1914 potato tests for resistance to *Synchytrium endobioticum*, 11 varieties and 2 seedlings not previously tested being listed as immune thereto.

It is stated that since the first variety tests were commenced in 1909, 360 varieties and seedlings have been tested. Of these, 90 were of continental or South American origin and 31 have proved to be immune, while of the 270 of British or North American origin only 63 have proved to be immune. About 23 varieties are listed which are considered to be the most desirable and readily obtainable.

Tests with formalin showed no perceptible difference in degree of attack.

Further examination of material previously studied has shown that the resting stage of *S. endobioticum* is not of common occurrence.

Beet tumors, J. Peklo (*Ztschr. Zuckerindus. Böhmen, 39 (1915), No. 5, pp. 204–219, figs. 5*).—The author describes the tumors resulting from the inoculation of sugar beet with *Bacterium beticolum*, obtained for this purpose from Smith after his discovery of this organism (E. S. R., 25, p. 243). *B. tumefaciens* was also used to inoculate various plants. The results, such as tumor formation, infection strands in stems, etc., are discussed, with emphasis on the similarities between the results as shown in beets, for example, and those in animals and human beings.

Relation of stomatal movement to infection by Cercospora beticola, Venus W. Pool and M. B. McKay (*U. S. Dept. Agr., Jour. Agr. Research, 5 (1916), No. 22, pp. 1011–1038, pls. 2, figs. 6*).—The results are given of a study of leaf infection of the sugar beet caused by *C. beticola.*

Infection was found to be determined by certain morphological and environmental factors which influence stomatal activity. Among the factors concerned in the movement of stomata are leaf maturity, light, temperature, and relative humidity. Infection, both artificial and natural, was found to occur best on mature leaves and to be influenced by the rapidity of germ tube growth, maturity of leaves, and stomatal movement. Penetration of the leaf by the conidial germ tubes of *C. beticola* has been observed to occur only through open stomata, and consequently it is thought that infection probably takes place during daylight hours. As soon as penetration of the germ tube occurs, an attempt is made by the leaf cells to isolate the invading organism, but when this is not possible the fungus grows and produces a well-defined leaf spot.

A fungus of uncertain systematic position occurring on wheat and rye, P. J. O'Gara (*Science, n. ser., 43 (1916), No. 1099, pp. 111, 112*).—A report is given of a fungus which is found attacking the heads of wheat and rye some time before they emerge from the leaf sheaths. Often the heads are said to be so severely attacked that they do not emerge but remain permanently within the sheath. The organism has been isolated and grown in pure cultures, but its identification has not been fully determined.

Fungus diseases of wheat, G. P. Darnell-Smith and E. Mackinnon (*Dept. Agr. N. S. Wales, Farmers' Bul. 102 (1915), pp. 3–31, figs. 28*).—This consists of information and suggestions regarding control, as condensed from various sources, relating to fungus diseases of wheat in New South Wales. These include bunt or stinking smut (*Tilletia tritici* or *T. levis*), loose smut (*Ustilago tritici*), flag smut (*Urocystis tritici*), rusts (*Puccinia graminis* and *P. triticina*), mildew (*Erysiphe graminis*), take-all (*Ophiobolus graminis*), ergot (*Claviceps purpurea*), and blight associated with several species of Septoria. A form of contortion described is attributed to insect attack or to disproportionate growth in two different directions.

Seeding time and attack by stinking smut, J. Appl (*Ztschr. Landw. Versuchsw. Österr., 18 (1915), No. 3, pp. 45–54*).—Results are given of studies on the influence of fungicidal treatments of seed wheat on subsequent attack by stinking smut, and also on the effects of seeding time and weather in this connection.

It is stated that the germination of wheat seed at the temperatures prevalent during the early part of October results in a higher percentage of attack by stinking smut than does that of seed planted earlier. By planting after October 30, however, the percentage of attack was diminished, owing probably to the fact that the fungus germinates at a somewhat higher minimum temperature than the seed, thus permitting the cereal to pass its period of greatest susceptibility comparatively free from attack.

It is thought probable, however, that soil moisture is a more important factor in attack by stinking smut than is the temperature during the germination of the seed.

A Phoma disease of western wheat grass, P. J. O'Gara (*Science, n. ser., 43 (1916), No. 1099, pp. 110, 111*).—A preliminary account is given of a Phoma disease of *Agropyron smithii*, a more extended account of which is promised for a later publication.

Gummosis, or the gumming of fruit trees, G. P. Darnell-Smith and E. Mackinnon (*Agr. Gaz. N. S. Wales, 26 (1915), No. 5, pp. 405–410*).—The authors give a brief historical survey, with notes on reports by several investigators, dealing more particularly with that of Butler (E. S. R., 24, p. 746).

While various causes and remedies are discussed, the general conclusion is reached that the one great measure, at once remedial and preventive in this connection, is proper attention to drainage.

[Venturia inæqualis and V. pirina in pure cultures], S. P. Novouspenskiĭ (*Zhur. Bolíezni Rast., No. 4–5 (1914), p. 130; abs. in Mat. Mikol. i Fitopatol. Ross., 1 (1915), No. 2, p. 61*).—The author briefly states that the apple scab fungus and the pear scab fungus are readily distinguishable in pure cultures by the color of their mycelium and the character of their growth. He also reports his observations on the development of apple scab in storage, the incubation period being only five days.

[Fusicladium pirinum in pure cultures], G. Íachevskiĭ (Jaczewski) (*Mat. Mikol. i Fitopatol. Ross., 1 (1915), No. 2, pp. 57–60, figs. 3*).—Growth of the pear scab fungus (*F. pirinum*) in the author's studies appeared to be normal on gelatin as well as on cooked potato, carrot, and pear, but somewhat retarded on apple. Involution forms such as were reported by Novouspenskiĭ (see above) in case of the apple scab fungus were not observed in the cultures of *F. pirinum*.

[On the etiology of Stippigkeit], I. L. Serbinov (*Zhur. Bolíezni Rast., No. 2–3 (1914), p. 51; abs. in Mat. Mikol. i Fitopatol. Ross., 1 (1915), No. 1, p. 75*).—Large losses are said to be sustained every year by Russian apple growers through a physiological fruit spot called in Germany Stippigkeit. Certain experiments conducted by the author have led him to think that this disease is due to intensive culture.

[White and brown fruit spot of pear], I. L. Serbinov (*Zhur. Bolíezni Rast., No. 4–5 (1914), p. 123; abs. in Mat. Mikol. i Fitopatol. Ross., 1 (1915), No. 2, p. 61*).—Two leaf spot fungi commonly appearing on pear leaves, *Septoria piricola* and *Entomosporium maculatum*, have been reported by the author as attacking the fruit also.

Experiments on American gooseberry mildew in Cambridgeshire, F. T. Brooks, F. R. Petherbridge and G. T. Spinks (*Jour. Bd. Agr. [London], 22 (1915), No. 3, pp. 227–230*).—The purpose of these experiments, which were made in 1913–14, was to see if some form of spraying or soil treatment carried out on a commercial basis could replace the present system of pruning. In 1914 the summer stage of the fungus was particularly prevalent and widespread, so that the experiments were carried out under severe conditions. The treatment was probably more carefully done than would often be the case in commercial enterprises.

Spraying twice in the early part of the spring with lime sulphur or Bordeaux mixture, while somewhat helpful, was not profitable. Soil treatment and winter spraying also proved to be ineffective. Heavy use of farmyard manure favored the disease by causing abundant succulent growth. Pruning is deemed the only practical means of checking the disease. This is best carried out in

autumn, as soon as danger of renewed growth is past, usually early in September. Since perithecia form on the berries as early as May, it is important to destroy all diseased fruit as soon as possible.

Studies in the physiology of parasitism.—I, The action of Botrytis cinerea, W. Brown (*Ann. Bot.* [*London*], *29* (*1915*), *No. 115, pp. 313–348*).—This contribution, the first of a series of studies now being carried out, is intended to lead the way to a fuller understanding of the more highly specialized parasites.

A method of preparing quickly and in practicable quantities a very powerful extract from the germ tubes of *B. cinerea* is described in some detail, as possibly applicable to other studies along similar lines.

It is stated that the extract shows two types of action on a plant cell, one on the cell wall leading to disintegration of the tissue, another on the protoplast producing death at a late stage of the former process. The extract may be deactivated by heating, mechanical agitation, or neutralization with alkali.

It is thought that neither oxalic acid nor oxalates have any share in producing the toxicity of the extract, and that any lethal substance present must be of a colloidal nature. The only active substance in the extract appears to be the enzym, which produces a macerating effect mainly by solution of the middle lamella, and which causes also the lethal action of the extract. The death of the cells is brought about presumably by its action, either directly on the protoplasmic membrane or indirectly as a result of its action on the cell walls. The ability of certain tissues to resist the action of the extract is dependent upon the special properties of their cell walls.

Perocid as a substitute for copper sulphate in combating Peronospora of grape stocks, F. Gvozdenović (*Ztschr. Landw. Versuchsw. Osterr., 18* (*1915*), *No. 1–2, pp. 11–28*).—This is an account and discussion of tests made with Perocid, a proprietary preparation to be used in the form of spray, paste, or powder for the control of Peronospora, and a comparison of the fungicidal values of such preparations with those of sprays in common use.

The hibernation of the powdery mildew of the vine (Uncinula necator) in Hungary, J. Ibos (*Borászati Lapok, 46* (*1914*), *Nos. 50, pp. 703, 704; 51, pp. 712, 713; 52, pp. 728, 729, figs. 8; abs. in Internat. Inst. Agr.* [*Rome*], *Mo. Bul. Agr. Intel. and Plant Diseases, 6* (*1915*), *No. 2, p. 312*).—The question as to how powdery mildew of grape passes the winter is said to be still unanswered. Istvánffi, in 1908, is said to have been the first to find the perithecia in Hungary.

The author observed considerable injury to grapes in the autumn of 1913. A large number of leaves examined in November showed perithecia on the mildew patches. The very abundant formation of these patches was thought to be due to the great variations in climatic conditions in that year, the summer being cool and wet and the autumn dry and warm.

A banana disease in Cuba, J. R. Johnston (*Estac. Expt. Agron. Cuba Circ. 47* (*1915*), *pp. 1–9, pls. 7*).—An account is given of the appearance, progress, and effects of a disease of banana in Cuba, which is stated to cause heavy losses in some districts and to threaten banana culture in this region.

The discoloration, wilting, and rotting of the parts is described, also the appearance of the stems in cross section, showing the relation thereto of the fungus, which is found in connection with the vascular bundles. The varieties which appear to be susceptible or resistant are indicated. The use of 0.2 per cent corrosive sublimate or other disinfectant is recommended, also removal of affected plants by cutting close to the ground and the application of quicklime to the stump.

Marasmius perniciosus n. sp., the cause of the krulloten disease of cacao in Surinam, G. Stahel (*Dept. Landb. Suriname Bul. 33* (*1915*), *pp. 27+25+26,*

pls. 12; abs. in Agr. News [Barbados], 14 (1915), No. 354, p. 382).—This contribution, which is given in Dutch, English (translation by A. M. W. Ter Laag), and German, is said to be the outcome of an investigation suggested by the publication of studies by Rorer (E. S. R., 29, p. 851) on the witches' broom disease of cacao in Surinam.

The organism, which is found in diseased shoots, indurated pods, and infected flower cushions of the cacao tree, is described as *M. perniciosus* n. sp. Mycelium isolated from diseased plants and used for inoculation gave no results, but spore material reproduced the disease.

While heavy shade appears to favor the fungus by the retention of moisture, it is thought best to decrease the shade gradually rather than suddenly. Drainage has the effect of strengthening the plants against attack. The diseased parts should be destroyed, and Bordeaux mixture should be applied to the trees in the form of a fine spray.

Coffee leaf disease (Hemileia vastatrix) in Uganda, S. SIMPSON and W. SMALL (*Proc. Internat. Cong. Trop. Agr., 3 (1914), pp. 365, 366*).—In an abstract here given of this paper, it is said to have been established that no record exists of coffee trees having been attacked locally by any species of Hemileia other than *H. vastatrix*, and that so far spores of this fungus from *Coffea robusta* have failed to infect leaves of cultivated coffee.

The drier weather of 1913 arrested the disease. Bordeaux and Burgundy mixtures have continued to give good results, but other applications have been disappointing.

No æcidial stage of *H. vastatrix* has yet been found. At least 10 genera of the Rubiaceæ occur in the Victoria Nyanza region, and 4 of these are known to harbor species of Hemileia in other localities.

Citrus canker, A. J. COOK (*Mo. Bul. Com. Hort. Cal., 3 (1914), No. 12, pp. 520, 521*).—This is partly a brief notice of information, furnished mainly by Berger (E. S. R., 34, p. 649) and by Stevens (E. S. R., 31, p. 54), regarding the origin, distribution, symptoms, and results of citrus canker, and partly a discussion of protective measures, including quarantines by States.

Citrus canker in America. The outbreak of a new disease, G. P. DARNELL-SMITH (*Agr. Gaz. N. S. Wales, 26 (1915), No. 6, pp. 517, 518*).—The author discusses an extract from a bulletin on citrus canker by Stevens (E. S. R., 31, p. 54) and one from the above article by Cook.

The discovery of the chestnut blight parasite (Endothia parasitica) and other chestnut fungi in Japan, C. L. SHEAR and N. E. STEVENS (*Science, n. ser., 43 (1916), No. 1101, pp. 173–176*).—The presence of *E. parasitica* on chestnut trees in the vicinity of Nikko, Japan, was definitely established from material received from several sources. In addition to *E. parasitica*, *E. radicalis* has been found on the bark of *Pasania* sp., a genus closely related to Quercus. This seems to establish the fact that *E. radicalis* is indigenous to Japan and is not confined to the genus Castanea.

The chestnut bark disease in Vermont, R. M. ROSS (*Vt. Forestry Pub. 16 (1915), pp. 16, pls. 4*).—It is stated that the chestnut blight, ascribed to *Endothia gyrosa parasitica*, and said to be found in all the New England States, threatens to infect all the chestnut areas in Vermont. No methods have been found effective in checking the disease or in saving a tree when once badly diseased.

While wood once infected begins to deteriorate within two years after the death of the tree, timber cut before infection may be seasoned and kept for many years. Suggestions for the utilization of chestnut wood are given. Complete destruction of all infected material is insisted upon.

Diseases of Hevea in Ceylon, T. PETCH (*Proc. Internat. Cong. Trop. Agr., 3 (1914), p. 172*).—In the abstract here given of this paper, it is stated that the diseases acquired by *H. brasiliensis* during its cultivation in the East for over 30 years have been comparatively few and mild.

The most important diseases of this tree in Ceylon at the present time are brown root disease (*Hymenochæte noxia*), pink disease (*Corticium salmonicolor*), dieback (*Botryodiplodia theobromæ*), and canker (*Phytophthora faberi*). The production of nodules and the decay of the tapped cortex are more serious phenomena which have not yet been traced to the agency of fungi.

[A larch leaf disease], A. A. LEBEDEVA (*Zhur. Bolîezni Rast., No. 4–5 (1914), p. 136; abs. in Mat. Mikol. i Fitopatol. Ross., 1 (1915), No. 2, p. 61*).—A serious larch leaf disease, attributed to *Hartigiella laricis* and resulting in a complete defoliation and death of nursery stock, has been described by the author as occurring in the Province of Voronezh, Russia. Spraying with Lazurin (a prepared Bordeaux mixture) and removing affected leaves gave very good results.

Peridermium harknessii and Cronartium quercuum, E. P. MEINECKE (*Science, n. ser., 43 (1916), No. 1098, p. 73*).—The author reports the successful inoculation of *Pinus radiata* with æciospores of *P. harknessii* and the fact that the mycelium of *C. quercuum* winters over in the old green leaves of *Quercus agrifolia*. The uredinial sori on the young leaves are said to be the results of infection from the sori on the old leaves. The author claims that if *P. harknessii* is connected with *C. quercuum*, this is a case of facultative heterœcism in both generations.

Brown oak and its origin, P. GROOM (*Ann. Bot. [London], 29 (1915), No. 115, pp. 393–408*).—An account is given of a study made on reddish or brown heartwood of individual trees of the species *Quercus robur* in Great Britain.

The change, which is little if at all injurious to the wood for a long time, is apparently due to a fungus, the conidiophores of which closely resemble those of Penicillium. On incipient brown oak of some specimens were produced small spheroidal basidiocarps which were identified by Massee as *Melanogaster variegatus broomianus*, but the identity of the conidiate fungus with the basidiate one was not established by pure cultures.

Results are also given of a study of the tannin in oak heartwood by W. P. Rial.

ECONOMIC ZOOLOGY—ENTOMOLOGY.

Birds of Porto Rico, A. WETMORE (*U. S. Dept. Agr. Bul. 326 (1916), pp. 140, pls. 10*).—This work is based upon investigations commenced in December, 1911, from which time continuous field work was carried on until September, 1912. All the principal regions of the island were visited, short trips having been made to the adjacent islands of Vieques and Culebra, and four days spent on Desecheo Island, in Mona Passage. As a result of this work more than 2,200 stomachs of birds collected at all seasons were available for laboratory study and investigation, about 2,000 of which were collected by the author. It is pointed out that the examination and results have additional importance as representing the first extended work of the kind carried on within the tropical regions of the Western Hemisphere.

In the introduction the author first presents the itinerary, following which he deals with the physiography of Porto Rico; bird life in cane fields, coffee plantations, and citrus groves; economic considerations; bird enemies of the mole cricket, sugar cane root borer, weevil stalk borer, and May beetle; methods of increasing birds; introduction of birds, etc.

The greater part of the work (pp. 17–129) is taken up by an annotated list of 178 species known to inhabit or visit Porto Rico. The data include the names by which the species is known, a brief account of its habits, and a statement regarding its food and economic status. In some cases detailed lists of insects and other animals, seeds, and fruits identified in the stomachs are given in systematic order, so that as the status of other forms of life becomes known the relation of the birds to them may be more easily ascertained. A bibliography of the literature relating to the ornithology of Porto Rico and a subject index are appended.

A peculiarity in the growth of the tail feathers of the giant hornbill (Rhinoplax vigil), A. WETMORE (*Proc. U. S. Nat. Mus., 47 (1915), pp. 497–500*).

Strychnin sulphate.—Its effect on California valley quail, C. C. PIERCE and M. T. CLEGG (*Pub. Health Rpts. [U. S.], 30 (1915), No. 50 pp. 3601–3604*).—The authors report experiments conducted which have been summarized as follows:

"In each case convulsions and death occurred within a period of two hours after administering the barley, and in each case the barley was reclaimed from the pouch of the squirrel after death, showing, what had already been proved, that strychnin is rapidly absorbed through the membranes of this organ.

"California valley quail may be fed, under natural conditions, relatively large amounts of strychnin sulphate without showing toxic symptoms. The minimum lethal dose by subcutaneous injection is 4 mg. per 100 gm. of body weight. The California ground squirrel (*Citellus beecheyi*) is very susceptible to strychnin sulphate; 0.09 mg. per 100 gm. of body weght produced convulsions. Nineteen grains of barley, containing 2.7 mg. of strychnin sulphate, when retained in the pouch of the ground squirrel, proved fatal. Poisoned barley, as used for ground squirrel eradication, does not cause the death of California valley quail under natural feeding conditions."

Five new mammals from Mexico and Arizona, E. A. GOLDMAN (*Proc. Biol. Soc. Wash., 28 (1915), pp. 133–137*).

Descriptions of a new genus and seven new races of flying squirrels, A. H. HOWELL (*Proc. Biol. Soc. Wash., 28 (1915), pp. 109–113*).

Five new rice rats of the genus Oryzomys from Middle America, E. A. GOLDMAN (*Proc. Biol. Soc. Wash., 28 (1915), pp. 127–130*).

The distribution and combat of the field mouse in Bavaria from 1902 to 1913, L. HILTNER (*Landw. Jahrb. Bayern, 4 (1914), No. 5, pp. 437–478, figs. 24*).—A description of the dissemination of this pest and of control work in Bavaria.

A systematic account of the grasshopper mice, N. HOLLISTER (*Proc. U. S. Nat. Mus., 47 (1915), pp. 427–489, pl. 1, figs. 3*).

Medical and veterinary entomology, W. B. HERMS (*New York: The Macmillan Co., 1915, pp. XII+393, figs. 228*).—In this work the subject is dealt with under the following headings: Parasites and parasitism; insect anatomy and classification; insect mouth parts; how insects carry and cause disease; cockroaches, beetles, and thrips; the lice; bedbugs and cone noses; mosquitoes; mosquitoes as disease bearers; mosquito control; buffalo gnats and horse flies; the common house fly; house fly control; bloodsucking muscids—tsetse flies, stable flies, horn flies; myiasis; fleas and louse flies; ticks; mites; and venomous insects and arachnids—bees, wasps, spiders, scorpions, etc. A general classification of bacteria and protozoa is appended.

[Papers on insects and insect control] (*Ann. Serv. Épiphyties, Mem. et Rap., 1 (1912), pp. VIII+462, pls. 3, figs. 80*).—The papers here presented of interest to economic entomologists include the following: *Icerya purchasi* in France

and the Acclimation of *Novius cardinalis*, by P. Marchal (pp. 13–26); The Acclimation of *N. cardinalis* in Gardens of the Peninsula of Cape Ferrato Invaded by *I. purchasi*, by G. Poirault and A. Vuillet (pp. 27–33); Protection of Cultivated Plants from Insects of Exotic Origin, by A. Vuillet (pp. 34–50); A Note on the Necessity of the Employment of Poisonous Substances, Particularly Arsenate of Lead, in Agriculture, by E. Roux (pp. 51–56); Opportunity for the Employment of Arsenicals, and Particularly Arsenate of Lead, in Agriculture, by P. Marchal (pp. 57–62); Tests of the Toxicity of Some Arsenical Compounds Employed in Agriculture, by H. Fabre (pp. 63–76); A Consideration of the Use of Arsenicals in the Southern Section, by F. Picard (pp. 77–79); The Potato Tuber Moth (*Phthorimæa operculella*), by F. Picard (pp. 106–176); Studies of a Disease of the Peach Tree in the Valley of the Rhone Caused by *Xyleborus dispar*, by J. Beauverie (pp. 186–195); The Fight Against *Diaspis pentagona* in Italy, by G. Gastine (pp. 196–219); The Asparagus Fly (*Platyparea pœciloptera*) in the Environs of Paris, by P. Lesne (pp. 228–247); The Cochylis and Eudemis Moths in 1912, by P. Marchal (pp. 248–252); Studies of the Cochylis and Eudemis Moths in Bordeaux in 1912, by J. Feytaud (pp. 253–330); The Cochylis and Eudemis Moths in the Valley of the Loire, by Vezin and L. Gaumont (pp. 331–338); Observations on the Cochylis and Eudemis Moths in Burgundy in 1912, by A. Paillot (pp. 339–351); Report on the Cochylis and Eudemis Moths in Southern France, by F. Picard (pp. 352–364); Tests of Illuminated Traps in Champagne in 1911–12, by J. Chatanay (pp. 365–371); Studies of the Vegetable Parasites of Cochylis and Eudemis Moths, by G. Fron (pp. 372–378); Studies of the Pathogenic Action of Divers Coccobacilli of the May Beetle, Silkworm, and Cochylis and Eudemis Moths, by E. Chatton (pp. 379–391); and A Note on the Coccidæ of West Africa, by P. Vayssière (pp. 426–432).

Work of the colonial entomologist, R. Mayné (*Bul. Agr. Congo Belge, 5 (1914), No. 4, pp. 577–600, figs. 8*).—The author here deals with the enemies of rubber in Belgian Kongo, and presents a note on an enemy of coffee (*Stephanoderes coffeæ*) and a brief account of the citrus butterfly (*Papilio demoleus*).

[Report of the entomologist of Southern Nigeria]. W. A. Lamborn (*Ann. Rpt. Agr. Dept. South. Nigeria, 1913, pp. 21–39*).—In this report for the period from May 26 to December 31, 1913, the author discusses the insect enemies of cotton, cacao, maize, guinea corn, peanuts, etc. Three species of ticks, namely, *Boophilus annulatus decoloratus*, *Rhipicephalus simus*, and *Amblyomma variegatum*, are said to abound in the district.

Insect pests of wheat, W. B. Gurney (*Dept. Agr. N. S. Wales, Farmers' Bul. 102 (1915), pp. 32–40, figs. 8*).—A brief account of the more important insect enemies of wheat in New South Wales.

Some of the more important truck crop pests in Georgia, W. V. Reed (*Ga. Bd. Ent. Bul. 41 (1915), pp. 39, figs. 29*).—A brief popular account is given of the more important insect enemies of truck crops and means for their control.

Carbon bisulphid and its use for grain fumigation, W. H. Goodwin (*Mo. Bul. Ohio Sta., 1 (1916), No. 3, pp. 86–90, figs. 3*).—Directions are given for the practical use of carbon bisulphid as an insecticide.

[Cranberry insects in Wisconsin], O. G. Malde (*Wis. State Cranberry Growers' Assoc. [Proc.], 28 (1915), pp. 15–17*).—This is a report of the occurrence of, and work of the season of 1914 with, the cranberry fruit worm, cranberry leaf miner, and cranberry tip worm.

Blueberry insects in Maine, W. C. Woods (*Maine Sta. Bul. 244 (1915), pp. 249–288, pls. 4, figs. 3*).—In his introduction the author first considers the status of the blueberry industry in Maine, which is restricted in large part to the

blueberry barrens of Washington County, comprising some 250,000 acres. It is stated that in 1912 90,000 bu. of blueberries were canned and the industry valued at $2,000,000. Three species of blueberries occur on the barrens, namely, *Vaccinium pennsylvanicum*, *V. canadense*, and *V. vacillans*, but the first two of these predominate decidedly. Since *V. canadense* ripens about 10 days later than *V. pennsylvanicum* the berry season is fairly long.

Accounts are given of eight insects of economic importance, all but one of which attack the fruit. The present account of the apple maggot is more at length than that previously noted (E. S. R., 32, p. 350). The maggot is the most important enemy of the blueberry in Washington County, to which locality the pest is largely restricted so far as this crop is concerned. A hymenopterous parasite, *Biosteres rhagoletis*, previously noted (E. S. R., 34, p. 456), was reared in considerable numbers from puparia obtained from blueberries in 1913, which apparently reduced the number of maggots considerably during the summer of 1914. With the large crop in 1913 only from 1 to 2 per cent was attacked, but the yield in 1914 was so small that from 8 to 10 per cent of the fruit was maggoty and conditions were much the same in 1915. It is stated that no measures aimed at complete control of the pest have proved really practical but that with an ordinary yield no elaborate system of control is needed. Burning the plains, as is commonly done, is a practice to be highly recommended since it not only restores the fertility of the land but destroys the puparia which lie near the surface of the soil.

A new cecidomyiid, i. e., itonidid, though found in the fruit in considerable numbers, is not of economic importance since it infests only decaying or decayed berries. Descriptions of this species and its several stages under the name *Lasioptera fructuaria* by E. P. Felt are incorporated in the account.

The pomace fly is said to have been reared in great numbers from blueberries placed in cages in the insectary as soon as the fruit had become a trifle old and had lost its firmness. It is pointed out that unless stored berries are packed securely and guarded against the attack of this fly, it may prove to be a very serious pest.

The currant fruit weevil (*Pseudanthonomus validus*) is quite widely distributed in Maine as a blueberry pest, occurring at both Orono and Cherryfield, the only places at which extensive collections of berries have been made for the study of their insect enemies. So far as known it is confined to the low blueberries (*V. pennsylvanicum* and *V. canadense*). Hibernation takes place in the adult stage. Oviposition commences about the middle of June while the berries are still small and green, the egg usually being placed in one of the calyx lobes. On hatching out, the larva tunnels to the center of the berry, leaving behind it a hardened reddish trail, which is very conspicuous in the green pulp. A single berry is said to furnish sufficient nourishment for one weevil, all parts of the fruit being eaten except the outer coat of the seeds, and the berry is left just a shell around a mass of fine brown frass. There is but one generation a year in Maine. A description of its several stages by W. D. Pierce is included.

A fruit caterpillar, thought to be *Epinotia fasciolana*, is, next to the maggot, the insect most commonly found in the fruit. This pest, while very abundant in 1913, was so extensively parasitized that it was quite rare the following year and had not appreciably reestablished itself in 1915. It appears to be generally distributed throughout the State. The eggs are deposited singly on the outside of the berry while it is still green, usually somewhere around the calyx lobe. Upon hatching out in most cases the larva enters the berry near the calyx end, usually on the outside of the berry at the base of one of the sepals, but some enter by the calyx cup and a few near the stem end. If

one berry does not contain enough food the larva may make its way to one which has been webbed to it. In 1913 its numbers were greatly reduced by an ichneumonid parasite of the genus Pimpla.

The blueberry damsel bug (*Nabis rufusculus*), which probably occurs throughout the State, deposits its eggs in the fruit and the nymphs, which are predaceous, live upon the plant, but this seems to be the only way in which the blueberry is directly concerned in their life cycle. Occasionally a little scale of the genus Pseudococcus is found in the calyx end of the berry.

In addition to the insects which attack the fruit, to which particular attention was paid by the author, a leaf beetle, namely, *Galerucella decora*, was observed to be decidedly injurious to the foliage of the blueberry in Maine. It is said to be widely distributed through the State and in the vicinity of Orono to have been very abundant during the past three seasons and to have killed a considerable number of blueberry bushes. It hibernates in the adult stage, and the eggs are deposited about the middle of June. The larvæ eat the leaves very rapidly and in great amount, the leaves being skeletonized and only the brown ribs and upper epidermis left. Bushes which are defoliated two or three years in succession usually are killed.

Insects affecting the coconut palm in Trinidad, F. W. Urich (*Bul. Dept. Agr. Trinidad and Tobago, 14 (1915), No. 6, pp. 200–203*).—An annotated list of the more important insects of the coconut palm in Trinidad.

Insects as carriers of the chestnut blight fungus, R. A. Studhalter and A. G. Ruggles (*Penn. Dept. Forestry Bul. 12 (1915), pp. 33, pls. 4*).—Following a brief review of the literature relating to the transmission of plant diseases by insects, the authors report the results of investigations conducted, including those obtained from cultures, the microscopic examination of centrifuged sediments, etc. The work has been summarized as follows:

"Each insect tested was placed in a flask containing 100 cc. of sterile water, kept there for at least several hours, small quantities of the water plated out in dilution plates, and the wash water centrifuged in case positive results were obtained. Tests were made of 21 ants used in certain laboratory and insectary experiments in which they had been permitted to run over chestnut bark bearing spore horns or active perithecial pustules of the chestnut blight fungus (*Endothia parasitica*). Five of these 21 ants were found to be carrying spores of the chestnut blight fungus.

"Tests were also made of 52 insects and 2 spiders brought in from the field. All but 3 of these were picked directly from the chestnut blight cankers. Both of the spiders yielded negative results, while 19 of the 52 insects from the field were found to be carrying spores of *E. parasitica*. Positive results were obtained from insects in the orders Hemiptera, Coleoptera, Diptera, and Hymenoptera. The only other order of insects represented was the Lepidoptera, of which only 2 individuals were tested, both with negative results.

"The number of viable spores of the blight fungus carried varied from 74 to 336,960 per insect. The cultures from 3 insects contained no fungus colonies except those of *E. parasitica*. Each of the 8 individuals tested of *Leptostylus macula*, one of the beetles which feeds on pustules of the blight fungus, yielded positive results. The 3 highest positive results obtained, 336,960, 145,340, and 8,538, were from *L. macula*. It was demonstrated that the spores of the blight fungus were easily shaken from the body of this beetle by its own movements.

"From the rate of development of the colonies of *E. parasitica* in cultures, it was determined that the insects from the fields were carrying pycnospores almost exclusively. A microscopic examination of the centrifuged sediments showed a very few ascospores, and these from only 5 insects. Pycnospores were present in the sediment from every insect yielding positive results. The

insects tested, even *L. macula*, which eats the pustules, were therefore carrying pycnospores almost exclusively. Most of the pycnospores were probably brushed off from normal or diseased bark, or both, by the movements of the insects over these surfaces. Some were probably obtained while eating the pustules, and some may have been obtained from the soil around the bases of diseased trees.

"Most of the insects were also carrying spores of fungi other than *E. parasitica.* The number of species of other fungi varied from 0 to 7 in the cultures, but was shown by microscopic examination of the centrifuged sediments to be greater, in at least some cases. In proportion to size, insects may carry a greater number of spores of the blight fungus than birds.

"We are led to the conclusion that some insects carry a large number of spores of the blight fungus, and that they are important agents in the local dissemination of this disease. This is especially true of the beetle, *L. macula.*"

A list of 55 titles of the literature cited is appended.

Hydrocyanic acid gas against household insects, L. O. Howard and C. H. Popenoe (*U. S. Dept. Agr., Farmers' Bul. 699 (1916), pp. 8*).—This is a revision of Bureau of Entomology Circular 163, previously noted (E. S. R., 28, p. 352).

Orthoptera of the Yale-Dominican expedition of 1913, A. N. Caudell (*Proc. U. S. Nat. Mus., 47 (1915), pp. 491–495*).

The genera of the tettiginiid insects of the subfamily Rhaphidophorinæ found in America north of Mexico, A. N. Caudell (*Proc. U. S. Nat. Mus., 49 (1916), pp. 655–690, figs. 28*).

[Migratory locusts in South America] (*Bul. Dept. Agr. Trinidad and Tobago, 14 (1915), No. 6, pp. 191–199, pls. 5*).—Several papers are here presented relating to the subject, including A Report on Locusts in Venezuela, by W. G. Freeman (pp. 191–194); Notes on the South American Migratory Locust (*Schistocerca paranensis*), by F. W. Urich (pp. 194–197); Report on the Inoculation of Locusts with *Coccobacillus acridiorum*, by J. B. Rorer (pp. 197, 198); and The Manurial Value of Locusts, by A. E. Collens (p. 199).

Inoculation experiments with *C. acridiorum* show that its virulence can be increased for the Venezuelan locust (*S. paranensis*) in a way similar to that used in Yucatan and Argentina. An experiment with the giant locust (*Tropidacris dux*) shows that the organism is virulent for it also.

Jerusalem's locust plague, J. D. Whiting (*Nat. Geogr. Mag., 28 (1915), No. 6, pp. 511–550, figs. 25*).—The author reviews the history of former locust invasions and describes and illustrates the great devastation caused by locusts in Jerusalem and the means that have been taken to combat them.

Observations on Chermes spp. in Switzerland, N. A. Cholodkovsky (*Russ. Ent. Obozr., 14 (1914), No, 2–3, pp. LXXIX–LXXXIII; abs. in Rev. Appl. Ent., 3 (1915), Ser. A, No. 7, pp. 343, 344*).—This reports observations on the biology of *Chermes* spp.

Identity of Eriosoma pyri, A. C. Baker (*U. S. Dept. Agr., Jour. Agr. Research, 5 (1916), No. 23, pp. 1115–1119, fig. 1*).—As stated by the author, this paper was written in order to reinstate the woolly aphis described by Fitch from apple (*Malus* spp.) roots, to point out its distinctness from the woolly apple aphis (*E. lanigerum*), with which it has been confused, and to place it among the species of the genus to which it properly belongs, namely, Prociphilus. In his studies the author has had Fitch's original notes on the species and his type of *Prociphilus pyri* at hand. Descriptive notes and figures of the species of Prociphilus are given as an aid in the placing of *P. pyri*.

Destruction of body lice, agents in the transmission of recurrent fever and exanthematous typhus, by oil of eucalyptus, E. Sergent and H. Foley (*Bul. Soc. Path. Exot., 8 (1915), No. 6, pp. 378–381; abs. in Amer. Jour. Trop. Diseases*

and Prev. Med., 3 (1915), No. 2, pp. 109–111).—The authors find that the oil of eucalyptus is an efficient disinfection agent for use against body lice in loco, on the clothing, and on the body while still clothed.

Descriptions of new species and genera of Lepidoptera from Mexico, H. G. DYAR (*Proc. U. S. Nat. Mus., 47 (1915), pp. 365–409*).

Lepidoptera of the Yale-Dominican expedition of 1913, H. G. DYAR (*Proc. U. S. Nat. Mus., 47 (1915), pp. 423–426*).

Report on the Lepidoptera of the Smithsonian biological survey of the Panama Canal Zone, H. G. DYAR (*Proc. U. S. Nat. Mus., 47 (1915), pp. 139–350*).

New genera and species of Microlepidoptera from Panama, A. BUSCK (*Proc. U. S. Nat. Mus., 47 (1915), pp. 1–67*).

Contributions toward the knowledge of the injurious Microlepidoptera of the fir and spruce, I. TRÄGÅRDH (*Skogsvårdsför. Tidskr., No. 11 (1915), pp. 813–874, figs. 49; abs. in Rev. Appl. Ent., 3 (1915), Ser. A, No. 6, pp. 290–292*).—The species here considered are *Dioryctria schützeella*, *Pandemis ribeana*, *Grapholitha* (*Epiblema*) *tedella*, *G.* (*Epinotia*) *nanana*, *Argyresthia illuminatella*, *Cacœcia piceana*, *Evetria resinella*, *Heringia dodecella*, *Cedestis gysselinella*, *Dyscedestis farinatella*, and *Ocnerostoma piniariella*. A bibliography of 28 titles is appended.

The noctuid moths of the genera Palindia and Dyomyx, H. G. DYAR (*Proc. U. S. Nat. Mus., 47 (1915), pp. 95–116*).

The pickle worm or cucumber worm (Diaphania nitidalis), H. GARMAN (*Kentucky Sta. Dept. Ent. and Bot. Circ. 3 (1915), pp. 7, figs. 5*).—This insect has been the source of considerable injury in Kentucky during the past three or four years, particularly to cantaloups and cucumbers. The injury commences about the middle of July and is at its height during August and early September. Several broods which overlap develop during this period. Treatment consists in rotation, the gathering and destruction of badly infested fruit, and plowing and harrowing immediately after the removal of the crop. Spraying with arsenicals may at times be employed to advantage but should be practiced with care.

The practical employment of the cacao moth parasite, W. ROEPKE (*Meded. Proefstat. Midden-Java, No. 18 (1914), pp. 25–27; abs. in Rev. Appl. Ent., 3 (1915), Ser. A, No. 6, pp. 313, 314*).—A description is given of the manner of rearing and liberating cacao moth parasites and of the destruction of hyperparasites.

Two new Canadian Diptera, J. M. ALDRICH (*Canad. Ent., 48 (1916), No. 1, pp. 20–22*).—*Exorista cæsar* reared from *Archips argyrospila* at Simcoe, Ontario, and *Frontina spectabilis* collected at Wabamic, Ontario, are described as new to science.

New western and southwestern Muscoidea, C. H. T. TOWNSEND (*Jour. N. Y. Ent. Soc. 23 (1915), No. 4, pp. 216–234*).

Diagnoses of new genera of muscoid flies founded on old species, C. H. T. TOWNSEND (*Proc. U. S. Nat. Mus., 49 (1916), pp. 617–633*).

The house fly, F. W. FITZSIMONS (*London and New York: Longmans, Green & Co., 1915 pp. VI+89, figs. 22*).—A small book of a popular nature which emphasizes the importance of combating the house fly.

The sporogony of Hæmoproteus columbæ, HELEN ADIE (*Indian Jour. Med. Research, 2 (1915), No. 3 pp. 671–680, pls. 3*).—The author concludes that "pigeons at the places and the times indicated are very heavily infected with Hæmoproteus; no other blood parasites were found. Lynchia flies associated with these pigeons are also very heavily infected with the sexual stages of a parasite analogous to Proteosoma and the malarial parasite. Where flies are

rare, pigeon infection is also rare. Kasauli pigeons show no flies and are, as far as my experience goes, free from infection.

"The development of Hæmoproteus can be traced in the fly; the oökinete, zygote, oöcyst, and sporozoite stages have all been demonstrated. Sporozoites have been seen in vast numbers in the salivary glands and streaming down the salivary duct. Both sexes of Lynchia carry the infection. Laboratory bred flies placed on infected birds have shown in due course both zygotes and sporozoites of the same type as those of naturally infected flies. Kasauli pigeons for good reasons thought to be uninfected (but not laboratory hatched) have become infected by flies taken off heavily infected Ambala birds (flies afterwards dissected and found infected). The sporogony of Hæmoproteus in this Lynchia is similar to that of Proteosoma and the malaria parasite. It is another instance of the cycle of Ross."

Fighting the fly peril, C. F. PLOWMAN and W. F. DEARDEN (*London: T. Fisher Unwin, Ltd., 1915, pp. 127, pls. 7, figs. 4*).—A popular and practical handbook.

Report on a mosquito survey at the mouth of the Connecticut River, P. L. BUTTRICK (*Connecticut State Sta. Bul. 189 (1915), pp. 5–32, pl. 1*).—This is a detailed report of a survey made with a view to ascertaining the location and character of mosquito breeding places, to determine how they can best be eliminated, and to estimate roughly the probable cost. It is thought that this survey with the accompanying map makes it possible for those interested to decide what work is most necessary, where money can best be spent, and the approximate cost.

Anopheles as a winter carrier of plasmodium.—The mosquito as a prophylactic indicator, M. B. MITZMAIN (*Pub. Health Rpts. [U. S.], 30 (1915), No. 29, pp. 2117–2121*).—The author reports upon investigations conducted at Scott, Miss., from February 3 to June 1, 1915.

During the three months from February 9 to May 9, 1,000 Anopheles mosquitoes collected were dissected and examined but no forms suggestive of the malarial plasmodium were encountered. Two mosquitoes (*Anopheles quadrimaculatus*) were found infected on May 15 and a third on May 26. The findings indicate that "at any time previous to May 15, in the locality investigated, protection from malaria may be secured by treating with quinin all the human carriers so that the insect carriers may not be permitted to carry out their rôle in completing the cycle. Failing this, prophylactic measures among healthy and other susceptible persons may be instituted any time, from May 15 to June 1, when it is considered the completion of the mosquito cycle in this locality makes preventive measures urgent."

The duck as a preventive against malaria and yellow fever, S. G. DIXON (*Jour. Amer. Med. Assoc., 63 (1914), No. 14, p. 1203*).—Attention is called to the habit of ducks of feeding upon mosquito larvæ.

Anastrepha serpentina, a new pest of fruits in Brazil, J. S. TAVARES (*Broteria, Ser. Zool., 13 (1915), No. 1, pp. 52–54; abs. in Rev. Appl. Ent., 3 (1915), Ser. A, No. 7, p. 387*).—In addition to the fruit flies *A. fraterculus*, *Ceratitis capitata*, and *Lonchæa ænea* which occur in Brazil, *A. serpentina*, which attacks the sapodilla (*Sapota achras*), has been discovered. About 30 days are required for its larval development and 15 for the pupal.

The biopathological relations of the Mediterranean fruit fly (Ceratitis capitata) and citrus fruits, L. SAVASTANO (*Ann. R. Staz. Sper. Agrum. e Frutticol. Acireale, 2 (1914), pp. 97–128; abs. in Rev. Appl. Ent., 2 (1914), Ser. A. No. 10, pp. 604, 605*).—The attack of the Mediterranean fruit fly is aggravated by an increase in the sugar content of citrus with the resulting decrease in acidity.

A bibliography of 47 titles is given.

Two new species of Pipunculus, F. KNAB (*Proc. Biol. Soc. Wash., 28 (1915), pp. 83–85, pl. 1*).—*Pipunculus industrius* and *P. vagabundus*, both reared from the sugar beet leafhopper (*Eutettix tenella*) at King City and Pleasanton, Cal., are described as new to science.

Notes on some Virginian species of Platypeza, N. BANKS (*Jour. N. Y. Ent. Soc., 23 (1915), No. 4, pp. 213–216, pl. 1*).

The life history and control measures for the cereal leaf beetle (Lema melanopus), G. KADOCSA (*Kisérlet. Közlem., 18 (1915), No. 1, pp. 109–178, pls. 8, figs. 3*).—A detailed report of studies of this pest conducted at the Royal Entomological Station in Budapest.

The western 12-spotted cucumber beetle, E. O. ESSIG (*Univ. Cal. Jour. Agr., 3 (1915), No. 1, pp. 12–15, figs. 3*).—This account relates to *Diabrotica soror*, a native of the Western States and especially abundant in California, where it is a source of considerable injury.

Problem of the bark beetle, J. M. SWAINE (*Canad. Forestry Jour., 11 (1915), No. 6, pp. 89–92, figs. 2*).—This account is based upon work previously noted (E. S. R., 32, p. 551).

Species of Rhynchites and Anthonomus pomorum injuring orchards, J. F. SCHREINER (*Trudy Bîuro Ent. [Petrograd], 2 (1914), No. 14, 3. enl. ed., pp. 65, figs. 32; abs. in Rev. Appl. Ent., 3 (1915), Ser. A, No. 9, pp. 533–535*).—Seven species of Rhynchites injurious in Russia are considered.

Boll weevils hibernating in cotton seed (*Mississippi Sta. Bul. 173 (1916), pp. 28, 29, fig. 1*).—This records the discovery of three live weevils in 2 lbs. of seed cotton in January while ginning a sample by hand. The weevils are said to have been inside the seeds, having entered apparently after the seeds were nearly or quite mature, as the seed coats were about normal.

The Mexican bean weevil, E. O. AMUNDSEN (*Mo. Bul. Com. Hort. Cal., 5 (1916), No. 1, pp. 33, 34, figs. 3*).—A Mexican bean, known as "guamuchile," is often found infested by *Bruchus limbatus*. It is also found in the seeds of other legumes and if unchecked renders them unfit for food or seed.

New genera of chalcidoid Hymenoptera, A. A. GIRAULT (*Jour. N. Y. Ent. Soc., 23 (1915), No. 3, pp. 165–173*).—Among the species here described of economic importance are *Holanusomyia pulchripennis* n. g. and n. sp., reared from the citrus mealy bug on bamboo at Manila, Philippine Islands; *Anagyrella corvina* n. g. and n. sp., reared from *Pseudococcus* sp., at Fresno, Cal.; *Metallonoidea brittanica* n. subg. and n. sp., reared from the oyster shell scale, at Manchester, England; *Pseudhomalopoda prima* n. g. and n. sp., reared from *Chrysomphalus aonidum* and *Aleurocanthus woglami*, at Kingston, Jamaica; and *Paraleurocerus bicoloripes* n. g. and n. sp., reared from a cherry leaf miner (*Lithocelletis* sp.), at Woods Hole, Mass.

Vespoid and sphecoid Hymenoptera collected in Guatemala by W. P. Cockerell, S. A. ROHWER (*Proc. U. S. Nat. Mus., 47 (1915), pp. 513–523*).

West Indian wasps, H. A. BALLOU (*Agr. News [Barbados], 14 (1915), No. 349, p. 298, figs. 4*).—A brief account of the more important wasps occurring in the West Indies.

Observations on the biology of Ixodidæ, II, G. H. F. NUTTALL (*Parasitology, 7 (1915), No. 4, pp. 408–456*).—In this second part of the work previously noted (E. S. R., 29, p. 58) the author reviews the literature relating to the biology of 14 species of ticks, in part, and reports original observations.

[Studies of Cimex], F. W. CRAGG (*Indian Jour. Med. Research, 2 (1915), No. 3, pp. 698–720, pls. 3, figs. 2*).—The author's work with Cimex is reported in two papers, the first relating to fertilization (pp. 698–705) and the second consisting of anatomical and physiological studies of the alimentary tract (pp. 706–720).

On the life history and morphology of Clonorchis sinensis, H. KOBAYASHI (*Centbl. Bakt.* [*etc.*], *1. Abt., Orig.*, *75* (*1915*), *No. 4, pp. 299–318, pls. 4*).—This report of studies at the Imperial Institute for Infectious Diseases has been summarized as follows:

"Liver distomiasis in Japan is caused by *C. sinensis.* The natives in the district where the disease is prevalent are infested with the parasites through eating fresh-water cyprinoid fishes raw that are the intermediate hosts.

"Experimentally the following 12 species are ascertained to be the intermediate hosts of the distome: *Pseudorasbora parva, Leucogobio güntheri, L. mayedæ, Sarcocheilichthys variegatus, Pseudoperilampus typus, Paracheilognathus rhombeum, Acheilognathus lanceolatum, A. limbatum, A. cyanostigma, Abbottina psegma, Biwia zezera,* and *Carassius auratus.*

"The encysted larva in the fish grows and reaches maturity in the cat, the dog, the rabbit, the guinea pig, and the rat. In the final host the cyst ruptures and the larva is set free. During the development in the final host, the spines of the 'cuticula' enlarge and then disappear. The size relations of the oral and ventral suckers are reversed. The final shape and position of the testes and the ovary are attained in 7 days and the egg formation begins in from 12 to 15 days.

"The parasite matures in from 23 to 26 days. Yellowish or brownish pigment of the adult is probably degenerated shell material contained in the yolk cells. Senile degeneration is found in larger specimens in which the vitellaria are partly [reduced] or wholly disappear, the pigment is present, and the uterus is empty. The liver distome in Japan constitutes a single species (*C. sinensis*)."

An outline of the morphology and life history of Crithidia leptocoridis n. sp., IRENE MCCULLOCH (*Univ. Cal. Pubs., Zool.*, *16* (*1915*), *No. 1, pp. 22, pls. 4, fig. 1*).—The flagellate parasite *C. leptocoridis* occurs in immense numbers in the intestinal tract of the common box-elder bug (*Leptocoris trivittatus*).

Studies in the life history of an ameba of the Limax group (Vahlkampfia calkensi), MARY J. HOGUE (*Arch. Protistenk.*, *35* (*1914*), *No. 2, pp. 154–163, pls. 3*).—Most of the oysters found around New York are said to be infested with this ameba, while the Cape Cod oysters and those found near Woods Hole are peculiarly free from it.

Identification of the stages in the asexual cycle of Bartonella bacilliformis, the pathogenic organism of verruga, and their bearing on the etiology and unity of the disease, C. H. T. TOWNSEND (*Jour. Wash. Acad. Sci.*, *5* (*1915*), *No. 21, pp. 662–667*).—The author reviews studies relating to verruga which appear to indicate conclusively that the Bartonella is a protozoan, and attempts to interpret correctly the stages in the asexual cycle of *B. bacilliformis.* Accounts relating to verruga and its transmission by *Phlebotomus verrucarum* have previously been noted (E. S. R., 32, pp. 248, 350).

FOODS—HUMAN NUTRITION.

The velocity of the staling of bread, J. R. KATZ (*K. Akad. Wetensch. Amsterdam, Versl. Wis. en Natuurk. Afdeel.*, *23* (*1914*), *pt. 1, pp. 652–655*).—In continuation of previous work (E. S. R., 28, p. 861), the author reports experimental data indicating that the velocity of the staling of bread and its loss of imbibing power (which is thought to depend on a physical change in the starch of the flour so that it becomes harder and less capable of holding water) do not run quite parallel. It was found that the diminished capacity of the starch to absorb water took place the more rapidly, and that the vapor

pressure of both fresh and stale bread was approximately equal to that of pure water.

The staling of bread, J. R. KATZ (*K. Akad. Wetensch. Amsterdam, Versl. Wis. en Natuurk. Afdeel., 23 (1914), pt. 1, pp. 655–658*).—From the results of a series of tests to determine the imbibing power and solubility of bread made of meals from several different kinds of grain the conclusion is given that the staling of bread is connected with a change which takes place not only with wheat and rye starch but also with all varieties of starch, but that it leads to practically important results only in the case of wheat and rye starch.

The staling of bread from the physiological-chemical standpoint, I–III, J. R. KATZ (*Hoppe-Seyler's Ztschr. Physiol. Chem., 95 (1915), No. 2–3, pp. 104–129; 136–146, fig. 1; 147–151*).—In the first of these papers, experimental data on the chemical and physical changes which take place when bread becomes stale are reported. These are in agreement with the work of Neumann (E. S. R., 32, p. 356). The author concludes that the principal cause of the staling of bread is a change in the starch, brought about by baking, by which the starch granules become harder and less capable of holding water and by which a part of the soluble polysaccharids become insoluble. At the same time there is a transference of the water in the starch to the gluten. Furthermore, the consistency of the gluten skeleton of bread influences the general texture of the bread.

In the second paper the author reports a further investigation of the changes produced in the starch granules of bread by baking and during staling. These data indicate that during baking the high temperature disturbs the equilibrium which ordinarily exists between starch, water, and gluten, and fresh bread results. During staling this equilibrium tends to be restored; at higher temperatures, accordingly, bread remains comparatively fresh.

In the third paper, from the data of experiments reported, he concludes that the starch granules of sago, rice, potatoes, barley, corn, oats, lentils, and marena undergo the same changes in the baking and staling of bread as occur in wheat and rye bread.

Changes in the microscopical structure of bread during staling, E. VERSCHAFFELT and E. VAN TEUTEM (*Hoppe-Seyler's Ztschr. Physiol. Chem., 95 (1915), No. 2–3, pp. 130–135, pls. 2*).—The authors describe studies of the microscopy of fresh and stale bread. The findings of these experiments are in agreement with Katz's theory of the staling of bread noted above.

How to grow the peanut and 105 ways of preparing it for human consumption, G. W. CARVER (*Alabama Tuskegee Sta. Bul. 31 (1916), pp. 35*).—In addition to information regarding the planting, cultivation, and food value of the peanut, 105 recipes are given for the use of peanuts in cookery.

Recent observations in the use of soy bean in infant feeding, J. F. SINCLAIR (*N. Y. State Jour. Med., 16 (1916), No. 2, pp. 83–88*).—The results are reported of feeding soy-bean gruel to 74 infants under three years of age, who were suffering with gastrointestinal disturbances. Owing to its high protein and fat content the gruel proved very efficient in checking the weight losses which occur so frequently during these disorders.

In conclusion other uses of soy-bean flour are mentioned: "It has proved useful when mixed with cereals, oatmeal, or barley jelly. It may be used in broths. Where condensed milk must be employed it is of service because it supplies the protein and fat which is needed and which condensed milk lacks."

Ice-cream making, A. C. BAER (*Wisconsin Sta. Bul. 262 (1916), pp. 36, figs. 4*).—The material in this bulletin is based upon the results of about 600 freezing tests with plain ice creams made by the station under commercial conditions, and may be summarized briefly as follows:

The body (general firmness) and texture (smoothness) of ice cream are influenced by a number of factors, such as the age and kind of cream used, the amount of milk fat or other milk solids in the mixture, and the kind and amount of filler used. In order to secure good body and texture the cream should be aged from 24 to 48 hours at a low temperature before being frozen. If the cream is properly aged the product retains good body and texture for a much longer period than otherwise. Experiments with creams having percentages of milk fat varying from 8 to 30 per cent showed that ice cream made from cream having less than 18 per cent of fat was weak in body and poor in texture. The thinner the cream used the more filler was needed to accomplish the desired results.

The time of freezing and the speed of the freezer is important. A mixture frozen too rapidly was coarse in texture and weak in body, while if the speed of the dasher or disks was too low the cream was not whipped to the proper consistency and smoothness.

Since an excessive overrun results in a product of poor quality it should be avoided. A number of factors which influence overrun were studied, and these showed in general that by careful standardizing of the ice cream "mix" and by regulating the freezing operation it was possible to obtain a uniform overrun from day to day. A raw cream produced a higher overrun than a pasteurized cream. Aging a pasteurized or homogenized cream made a higher swell possible. Rapid freezing resulted in a lower overrun than when sufficient time was given to properly whip up the mixture. The kind and amount of filler did not seem to affect the overrun. A high swell resulted in an open-textured, light, foamy ice cream, and such a product was of poorer quality than one with less overrun. Because the amount of overrun affects the weight of ice cream, the nutrients in a given volume will also be affected; a high overrun ice cream contains less nutrients than a lower overrun product.

The flavor of ice cream is influenced by several factors, among them quality of flavoring materials, richness of cream, taints of cream, kind of cream, filler, and storage of the finished product. A pure extract of vanilla will produce a more pleasant flavor than cheap, imitation compounds. The natural fruit flavors are more desirable than the cheaper grade of extracts. An old, tainted, partly sour cream can not be made into a good ice cream. An excessive use of a low grade gelatin or ice-cream powder always can be detected in the flavor.

Considerable data are also given regarding the processes of freezing; the temperature during freezing; packing; and testing. A few simple formulas are given together with suggested score cards for judging ice cream. It is stated that creameries and milk plants can profitably make ice cream without much additional equipment, and if advantageously located they can install an equipment for manufacturing ice cream for about $500.

The manufacture of ice creams and ices, J. H. FRANDSEN and E. A. MARKHAM (*New York: Orange Judd Co., 1915, pp. XIV+315, figs. 108*).—The chapters included in this book are the cream supply; the bacteriology of ice cream; the care of milk and cream at the factory; condensed milk, milk powder, and homogenized cream; stabilizers; flavoring; standardizing the ice cream mixture; preparing the ice cream mixture; classification of ice cream; ice cream formulas; water ices and sherbets; fancy molded ice creams; the freezing process; refrigeration; the economical operation of the refrigerating plant; scoring ice creams and ices; the ice cream factory, its location and equipment; factory management; by-products and side lines; and ice cream as a side line in the local creamery.

[Report of food and drug laboratory], H. E. BARNARD (*Ind. Bd. Health, Ann. Rpt. Chem. Div. Lab. Hyg., 9 (1915), pp. 1–153, figs. 39*).—The work of the laboratory during the year ended September 30, 1914, is reviewed. This included the analysis of 1,703 samples of miscellaneous foods, of which 1,279 were found to be legal, and of 294 samples of drugs, of which 261 conformed to existing standards. Sanitary inspections were made of 12,106 places, including grocery stores, meat markets, drug stores, bakeries, hotels, and restaurants, of which 50 per cent were found to be in good condition.

Special reports are given of a sanitary survey of canneries and bottling works operating in the State. Reprints are included of A Study of Fruit Jar Caps, by Gail M. Stapp (E. S. R., 32, p. 856), and The Effect of Bread Wrapping on the Chemical Composition of the Loaf, by H. E. Barnard and H. E. Bishop (E. S. R., 32, p. 354). Reprints of various instructions and notices issued by the food commissioner conclude the report.

Electric cooking in a cafeteria, B. E. HANNON (*Jour. Electricity, 36 (1916), No. 15, pp. 280, 281, figs. 2*).—The electric cooking equipment of a cafeteria is described in detail, cost data being included.

School lunches, CAROLINE L. HUNT and MABEL WARD (*U. S. Dept. Agr., Farmers' Bul. 712 (1916), pp. 27*).—Although this publication was prepared primarily to furnish information regarding the foods best suited for the children's noon meal and for the school lunch basket, it emphasizes the fact that all three meals in a day's ration must be considered together and considerable space is devoted to the general food requirements of children. General information and suggested bills of fare are given for the home lunch, for the basket lunch, and for meals prepared at school. A few recipes for school-lunch dishes are included.

The child and its care, NEALE S. KNOWLES, LOUISE H. CAMPBELL, and MABEL C. BENTLEY (*Iowa State Col. Agr. Ext. Dept., Home Econ. Bul. 2 (1915–16), pp. 32, figs. 14*).—Considerable information is contained in this bulletin regarding the diet of infants and of children three years of age or more, suggestive lists of foods and menus being included. Hints are also given regarding the personal hygiene and clothing of children.

The physiology of the newborn infant. Character and amount of the catabolism, F. G. BENEDICT and F. B. TALBOT (*Carnegie Inst. Washington Pub. 233 (1915), pp. 126, figs. 10*).—In this publication the authors refer to earlier researches with newborn infants by other investigators and to the former paper by themselves (E. S. R., 32, p. 461). A translation is given of an article reporting respiration experiments with newborn infants, by K. A. Hasselbalch, who draws the conclusion that a well-nourished infant born at full term has a store of carbohydrates (glycogen) in its organs which is spent in the course of a few hours and that "the metabolism of a poorly nourished and premature infant depends chiefly on the oxidation of carbohydrates during the first hours of life." The conclusions of Hasselbalch are discussed by the authors in the light of other experiments.

The experiments here reported consist of observations of the metabolism of 105 newborn infants and include several hundred experimental periods. The technique employed is described in detail and the statistics of the observations are presented in tabular form.

An analysis of the data for the minimum metabolism periods shows that on the first day of life there are important temperature regulation disturbances which result either in a decreased metabolism, or an increased metabolism when there is an effort on the part of the infant to compensate for the loss of heat. After the second day there is a fair uniformity in the heat production

per square meter of body surface and a remarkable uniformity per square meter of body surface per unit of length. This constancy is such as to permit the establishment of a factor which indicates that when the square meter of body surface as computed from the body weight is divided by the length the metabolism per unit is 12.65 calories. From a study of the effect of temperature changes on the basal metabolism and the amount of available breast secretion in the first week of life, certain procedures for the conservation of energy and supplemental feeding are suggested.

Acceleration of growth after retardation, T. B. Osborne, L. B. Mendel, Edna L. Ferry, and A. J. Wakeman (*Amer. Jour. Physiol., 40 (1916), No. 1, pp. 16–20, pls. 2*).—Curves are given illustrating the accelerated growth of a number of albino rats in which growth had previously been retarded either intentionally by the character of the diet or incidentally as the result of a failure on the part of the animals to eat enough of a supposedly adequate ration. The authors conclude that "after periods of suppression of growth, even without loss of body weight, growth may proceed at an exaggerated rate for a considerable period. This is regarded as something apart from the rapid gains of weight in the repair or recuperation of tissue actually lost. Despite failure to grow for some time the average normal size may thus be regained before the usual period of growth is ended."

Studies in water drinking.—XX, The relationship of water to certain life processes and more especially to nutrition, P. B. Hawk (*Biochem. Bul., 3 (1914), No. 11–12, pp. 420–434*).—In this summary and digest of data, continuing previous work (E. S. R., 34, p. 763) the author describes the physiological needs of the body for water from both the physical and the chemical standpoints. With regard to water drinking at mealtime, he concludes that for the normal individual "the drinking of a reasonable volume of water with meals will promote the secretion and activity of the digestive juices, the digestion and absorption of the ingested food, and will retard the growth of intestinal bacteria and lessen the extent of the putrefaction processes in the intestine."

The relation of salivary to gastric digestion, L. A. I. Maxwell (*Biochem. Jour., 9 (1915), No. 3, pp. 323–329; abs. Jour. Chem. Soc. [London], 108 (1915), No. 637, I, p. 1024*).—From the experimental data here reported, the author concludes in part that unboiled starch does not hinder peptic digestion, but that all cooked farinaceous foods do this unless first subjected to salivary digestion.

Gastrointestinal studies.—XII, Direct evidence of duodenal regurgitation and its influence upon the chemistry and function of the normal human stomach, W. H. Spencer, G. P. Meyer, M. E. Rehfuss, and P. B. Hawk (*Amer. Jour. Physiol., 39 (1916), No. 4, pp. 459–479, figs. 12*).—The experiments here reported were undertaken to determine whether or not duodenal regurgitation does occur, as evidenced by the presence of some of the constituents of the duodenal secretions in the samples of material removed from the stomach. Of these constituents, trypsin was regarded as the most satisfactory indicator. Quantitative determinations of trypsin were made in samples of the stomach contents, obtained by fractional removal through the Rehfuss tube as has been described in earlier papers of this series. The samples were taken after the introduction into the stomach of hydrochloric acid; vinegar; water; sodium bicarbonate solutions of various strengths; and a small Ewald meal, both with water and with sodium bicarbonate solutions. From the results of these tests, which are reported in detail, the following conclusions are drawn:

"A tryptic enzym is almost constantly present in the fasting and digesting contents of the normal human stomach. . . . [This] is deduced to be trypsin regurgitated from the duodenum.

"Trypsin in the gastric contents is highly resistant to the action of acid and pepsin. In general, tryptic value is high in the presence of low acidity and in alkaline reaction, and of low value when the gastric contents are of high acid concentration. A fall in the acidity is usually accompanied by a rise in the tryptic values.

"The color of the gastric contents often changes during the period of experiment from that of the ingested material to a golden yellow or a dark olive or blue green. This color change is due to regurgitation of bile from the duodenum and is absent on a diet of substances which do not cause the outpouring of bile. The tryptic values in the gastric contents usually rise concomitantly with the color change, although in a non-bile stimulating diet the tryptic value seems independent of the color.

"Sodium bicarbonate in 5 per cent solution is held in the stomach until sufficient hydrochloric acid is secreted to bring the alkalinity to a point where it is nonirritating to the duodenum. The retention is accompanied by a high trypsin value—suggesting antiperistalsis in the duodenum in response to an irritant. Sodium bicarbonate in 1 per cent solution hastens the emptying of the stomach either by increasing the motility of the stomach or opening the pylorus. Sodium bicarbonate solutions do not inhibit human gastric secretion, but seem to have a direct stimulatory effect in some cases.

"Free hydrochloric acid seems unnecessary for the opening of the pylorus, for the stomach sometimes empties while its contents are still alkaline. Five-tenths per cent of hydrochloric acid ingestion is followed by a rapid fall in acidity to about 0.2 per cent, due to a regurgitation of alkaline duodenal contents, as is indicated by the rise in tryptic values coincident with the fall of acidity. The acid is then emptied from the stomach.

"Regurgitation of duodenal contents into the stomach is but another of the protective functions of which the body furnishes so many examples and has for its purpose the defense of the small intestines from irritants."

An extended bibliography is appended.

For earlier work in this series see a previous note (E. S. R., 34, p. 659).

Green color in mother's milk after the ingestion of liver, E. FEER (*Biochem. Ztschr., 72 (1916), No. 5–6, p. 378*).—In the case of wet nurses it was observed that the milk secreted a few hours after the ingestion of beef or calves' liver had a green color, which was noticeable on comparing it with normal milk. The condition persisted for about 16 hours. The suggestion is offered that the color is due to the presence of some derivative of the coloring matter present in the liver eaten.

Fasting studies.—XIV, The elimination of urinary indican during two fasts of over 100 days each, C. P. SHERWIN and P. B. HAWK (*Biochem. Bul., 3 (1914), No. 11–12, pp. 416–419*).—In connection with previous studies of this series (E. S. R., 30, p. 765) two fasting experiments with a dog are reported. The fasting periods were 117 and 105 days in length, differing only in the fact that the 105-day fast was a "repeated" one.

During the initial fast of 117 days the indican output was continuous and fairly high throughout, while during the repeated fast of 105 days the indican values were much lower. On the basis of these observations, the authors conclude that "the finding of diminished intestinal putrefaction as a result of 'repeated' fasting is in line with other observations . . . which have shown that 'repeated fasting' is accompanied by greater resistance, a less rapid loss in body weight, less pronounced protein catabolism, and a general physical and mental improvement."

ANIMAL PRODUCTION.

Experiments on the Mendelian laws of inheritance, C. PUCCI (*Mod. Zooiatro, Parte Sci., 25 (1915), No. 4, pp. 145–153, figs. 6*).—Gray Flemish rabbits and white Polish rabbits were crossed. In F_1 the gray color of the Flemish parent was dominant to the white of the Polish, but almost all the rabbits showed whitish spots. The F_2 generation consisted of 52 pigmented and 16 white individuals, thus following the Mendelian ratios. It appears that the self-colored individuals of the F_2 generation behave as heterozygotes and the white as homozygotes.

Rambouillet rams were crossed on Middle Tiber Valley ewes, which are noted for their very convex profile of nose and forehead, an open fleece, and the head, throat, belly, and limbs devoid of wool. In the F_1 generation all the crosses had a straight face profile. In the F_2 generation the convex profile appeared in ratio very nearly following Mendel's law. The extent of the fleece was greater in individuals with a straight profile, and seemed to follow, like the latter characteristic itself, the laws of dominance and of the numerical constancy of reversion.

Variability under inbreeding and cross-breeding, W. E. CASTLE (*Amer. Nat., 50 (1916), No. 591, pp. 178–183*).—This paper comments on Walton's studies and conclusions (E. S. R., 34, p. 370). The author points out the utility value of both inbreeding and cross-breeding in securing variations, and shows that each has its utility at the proper time and place.

[Mice breeding experiments], W. F. R. WELDON (*Biometrika, 11 (1915), No. 1–2, App., pp. 60, pl. 1, figs. 7*).—Complete data on mice breeding experiments are given.

The determination of sex, J. REGNAULT (*Compt. Rend. Assoc. Franç. Adv. Sci., 1914, pp. 554–557*).—This is a short review of some of the principal theories on the determination of sex as applied to man, with special emphasis upon the influence of nutrition.

Duration of the spermatozoa after fecundation, in the pullet and the duck, A. CHAPPELLIER (*Compt. Rend. Assoc. Franç. Adv. Sci., 1914, pp. 519–526*).—In his studies the author found that the extremes of duration of the spermatozoa after fecundation ranged from 10 to 18 days in the pullet and from 7 to 11 days in the duck. A bibliography of references on the subject is given.

The effect of castration on the weight of the pituary body and other glands of internal secretion in the rabbit, A. E. LIVINGSTON (*Amer. Jour. Physiol., 40 (1916), No. 2, pp. 153–185, figs. 8*).—The author concludes as the result of his studies with rabbits that "there is no constant sex difference in the weight of the hypophysis. Neither males nor females show a constant hypophyseal hypertrophy following castration or spaying. The females may be regarded as showing a more constant response by the hypophysis after spaying than is to be seen among the males after castration.

"From the curves of growth corresponding to each group there is a constant relationship between the rate of increase in body weight and the response of the hypophysis to castration or spaying. There is less hypertrophy of the hypophysis in those groups which show an increase in rate of growth. In groups where no effect can be shown upon the rate of growth a distinct hypertrophy of the hypophysis is constant, though in no case is it very marked.

"A marked atrophy of the uterus follows removal of the ovaries from females. No change in the weight of the heart or the kidneys can be attributed to castration or spaying. No change can be demonstrated in the thyroid with the possible exception of a moderate decrease in males after castration. The

suprarenals show no marked effect. In the males a tendency toward enlargement follows castration, which does not appear after spaying females. No conclusions were reached as to the effect of castration or spaying on the thymus or pineal gland."

A bibliography of references is given.

Studies on the carotin group of the animal body.—I, Insecta, P. SCHULZE (*Sitzber. Gesell. Naturf. Freunde Berlin, No. 1 (1913), pp. 1–22, pls. 3, figs. 3*).—This reports a study of the chemical and physical nature and the physiological significance of the carotinoids in insects.

Studies of the carotin-xanthophyll group.—II, The carotin structure of the Chrysomelidæ, P. SCHULZE (*Sitzber. Gesell. Naturf. Freunde Berlin, No. 8–9 (1914), pp. 398–406, pls. 2*).—This is a continuation of the above and treats of the physiological characteristics of the carotin-xanthophyll group as found in the Chrysomelidæ. A bibliography is given.

The palatability of farm grasses, C. G. WILLIAMS (*Mo. Bul. Ohio Sta., 1 (1916), No. 3, pp. 70–72*).—In two experiments to determine the palatability of various farm grasses 4 horses were fed from 18 to 20 lbs. of hay a day, one-half of the hay of each feed being timothy, and the remainder an equal weight of one of the other hays, a different one being tried each succeeding day. The timothy was placed in one end of the manger and the hay to be compared with it in the other end.

It was found that, in general, the mixed clover and timothy hay was more palatable than timothy or any other one grass. Brome grass stood second and timothy third. While the rye grasses (Italian rye and perennial rye) received high rank in the first test, they did not hold up as well in the second, and it is probable that their proper position is intermediate. Tall oat grass was decidedly inferior as regards palatability, with blue grass and redtop close seconds.

Kafir corn ("dari") from South Africa (*Bul. Imp. Inst. [So. Kensington], 13 (1915), No. 3, pp. 379, 380; abs. in Analyst, 41 (1916), No. 478, p. 8*).—Analyses are given of various types of South African Kafir corn.

Comparative experiments with feed roots, 1912–1914, P. BOLIN (*Meddel. Centralanst. Försöksv. Jordbruksområdet, No. III (1915), pp. 25, figs. 2; K. Landtbr. Akad. Handl. och Tidskr., 54 (1915), No. 4, pp. 365–388, figs. 2*).—Experiments were made with various feed roots during three years for the purpose of ascertaining their contents of dry matter. The roots under experimentation were 3 kinds of Bortfelder, 3 Yellow Tankards, and 2 Ostersund turnips; 3 kinds of Bangholm and 2 kinds of Swedish turnips; and the Barres and Eckendorfer fodder beets.

It was found that the various kinds of the same roots are quite similar in the amount of dry matter gathered from 1 hectare, as when one kind yields a greater percentage of dry matter another gives a greater yield of crop. The oblong Bortfelder and the Yellow Tankard turnips were superior to the white Ostersund, and among the beets, the Barres proved superior to the cylindrical Eckendorfer. In comparing the three kinds of roots, the Bortfelder, Yellow Tankard, and Ostersund turnips proved inferior in dry-matter content to the beets and Swedish turnips. The Swedish turnips gave best results in central, the beets in southern Sweden. The former developed better during the wet and cold season of 1912, while the beets gave better results during the dry and warm summer of 1914.

Value of blood and other offal for feeding purposes (*Wiener Landw. Ztg., 65 (1915), No. 38, pp. 310, 311, figs. 2; abs. in Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases, 6 (1915), No. 7, pp. 970, 971*).—An appa-

ratus for the utilization of blood and other slaughterhouse offal as food for live stock is described.

The breeds of live stock, C. W. Gay (*New York: The Macmillan Co., 1916, pp. XVIII+483, pls. 16, figs. 99*).—This book, which is one of the Rural Textbook Series, treats of the various breeds of horses, cattle, sheep, goats, and swine.

Steer feeding, J. C. Burns (*Texas Sta. Bul. 182* (*1915*), *pp. 3–16, pls. 6*).—Five lots of 12 2-year-old Hereford steers were fed for 140 days the following daily rations per head: For the first 90 days, lot 1, 4.72 lbs. of cotton-seed meal and 48.52 lbs. of corn silage; lot 2, 9.45 lbs. of cold pressed cotton seed and 41.46 lbs. of corn silage; lot 3, 4.72 lbs. of cotton-seed meal, 35.23 lbs. of corn silage, and 6.86 lbs. of rice bran; lot 4, 4.72 lbs. of cotton-seed meal, 35.08 lbs. of corn silage, and 9.1 lbs. of ground milo-maize heads; and lot 5, 4.72 lbs. of cotton-seed meal and 48.52 lbs. of corn silage; and during the last 50 days, lot 1, 6 lbs. of cotton-seed meal and 50 lbs. of sorghum silage; lot 2, 12 lbs. of cold pressed cotton seed and 36.16 lbs. of sorghum silage; lot 3, 6 lbs. of cotton-seed meal, 34.66 lbs. of sorghum silage, and 7.56 lbs. of rice bran; lot 4, 6 lbs. of cotton-seed meal, 32 lbs. of sorghum silage, and 12 lbs. of ground milo-maize heads; and lot 5, 6 lbs. of cotton-seed meal and 50 lbs. of sorghum silage.

These steers made, for the entire period of 140 days, average daily gains per head of 1.94, 2.15, 2.27, 2.44, and 2.07 lbs., at a cost for feed of 7.52, 8.3, 8.09, 9.2, and 7.05 cts. per pound of gain for the respective lots. The average net shrinkage in shipping was 7.6, 5.3, 5.65, 5.53, and 7.16 per cent for the respective lots, while the dressing percentages were 56.89, 57.05, 58.04, 58.46, and 56.55. The net profits per steer were $1.24, $1.90, $3.44, $0.34, and $1.18 for the respective lots.

Hogs were placed in several of the pens, but the results indicate that there is danger of loss in having them follow cattle that are receiving full rations of cotton-seed meal. Previous tests indicate, however, that they may follow, with a fair degree of safety, cattle that are receiving only enough cotton-seed meal (from 3 to 4 lbs. for each 1,000 lbs. of live weight per day) to balance their ration.

It is stated that, based on the selling prices of 7.35 cts. per pound for lot 1 and 7.5 cts. for lot 2, cold pressed cotton seed could have cost $23.90 a ton and proved of equal value to cotton-seed meal at $28 a ton. Rice bran at $16.70 a ton proved profitable in supplementing cotton-seed meal and silage and was more profitable for this purpose than ground milo-maize heads at $20 a ton. In fact, based on the selling prices of 7.65 cts. per pound for lot 3 and 7.75 cts. for lot 4, rice bran could have cost $22.92 a ton and proved of equal value to the ground milo-maize heads at $20 a ton. It was very evident that the milo-maize heads, which contained about 75 per cent grain, were much more palatable than the rice bran. When the latter is used it is deemed very important that it be fresh and of good quality and that it be fed during the fall and winter months. During warm weather it becomes rancid very quickly and in such condition cattle do not relish it and it deteriorates in feeding value.

Based on the final weight at Fort Worth, lot 5, that had had access to a shed open on the south side, gained 23 lbs. a head more than lot 1, fed in a similar pen without shelter, both having received the same kind and amount of feed. Had lot 5 sold for 7.35 cts. per pound as did lot 1, there would have been a difference in profit in its favor of $1.40 a head.

The results of the experiment indicate that "without a greater margin or spread between the prices for feeders and the prices for fat cattle than was had in this case, there is practically no direct profit in feeding cattle with feeds at the prices herein quoted."

Relation of steer feeding to farm returns, C. A. WILLSON (*Tennessee Sta. Bul. 114* (*1915*), *pp. 79–110, figs. 6*).—This is a restatement and continuation of work previously noted (E. S. R., 20, p. 665). The primary object of these experiments was to determine the amounts of beef that an acre of land would produce if the crops grown upon it were fed to live stock.

Seven 1-acre plats of the following crop rotations were grown, as follows: Plat 1, soy beans and barley; plat 2, cowpeas and barley; plat 3, corn and barley; plat 4, soy-bean hay and barley; plat 5, soy beans and wheat; plat 6, soy-bean hay and oats; and plat 7, alfalfa. During seven years, from 1908 to 1914, inclusive, the average annual beef production per acre was 508, 451, 434, 435, 402, 456, and 515 lbs., for the respective lots.

The experiments indicated that better results in beef production can be secured from the rotation of soy beans and barley than from any other combination of crops tested. The alfalfa acre ranked first in yield of beef for three years and last for one year. In beef yield it was the ranking acre, but has not been on experiment so long as some of the others. The soy-bean and barley acre ranked ahead of it in gross returns per acre, being first for two years, second for two years, never lowest, and for five of the seven years among the upper half of the acres in beef production. Oats and soy-bean hay have been on experiment for only four years, and although they have made a good showing for that time not enough results have been obtained to warrant the drawing of conclusions. The cowpea and barley acre has not averaged so well as the soy-bean and barley acre. It has never ranked first in production, but has, however, for three years produced more than 500 lbs. of beef per acre. The corn and barley acre thus far has proved to be nearly the poorest of the acres for the production of beef, ranking five years out of the seven in the lower division. The use of corn and barley as a rotation for the growing and finishing of beef cattle is not recommended as compared with soy beans and barley.

The beef produced was valued at 6 cents per pound, the silage fed at \$3 per ton, and it was assumed that there would be a margin of \$1 on 1,000-lb. steers for the 60- to 90-day feeding period. On this basis it is calculated that the gross returns per acre were \$61.23, \$58.94, \$56.92, \$57.07, \$55.99, \$59.23, and \$58.91, for the respective lots.

These experiments were so conducted as also to determine whether it would be better to feed the crops grown in a short feeding period with a heavy ration, or to feed a lighter grain ration and thus extend the time for finishing. When fed for 90 days on the lighter grain ration the average gain per acre was 584, 447, 527, 492, 354, 570, and 515 lbs. for the respective lots, while when fed for 60 days on a heavy ration the average gains per acre were 375, 453, 301, 277, 417, and 417 lbs. for the respective lots. The steers on the 90-day feed made 33 per cent larger gains than the steers on the 60-day feed, owing to a greater utilization of the roughages grown on each acre. Also the increased finish which the steers on 90-day feed put on would probably make them bring from 0.25 to 0.5 ct. more per pound than the steers on 60-day feed.

Data on the prices obtained for grains and hay by marketing through steers by the foregoing methods are given, also the prices the grains must sell at when not fed to make up for fertility returned by steers when fed.

Profits and losses in cattle feeding (*Wallaces' Farmer, 41* (*1916*), *No. 10, p. 398, fig. 1*).—A chart is given which shows the relation over a long period of years between cattle and corn prices. During 1914 and 1915 cattle lost money to the average feeder. During January, 1916, the loss was about \$13 per head and during February about \$12. Better conditions for the near future are indicated.

Calf-feeding experiments (*Agr. Gaz.* [*London*], *83* (*1916*), *No. 2201, pp. 151, 152*).—In experiments conducted at the college farm at Kilmarnock, Scotland, one lot of 4 calves was fed on new milk, the actual quantity of whole milk consumed being equivalent to an average of 1.75 gal. per calf per day over the whole experimental period. Hay was fed ad libitum from the time the calves were six weeks old, and linseed cake was introduced when the calves were eight weeks old. In one trial the calves made an average weekly gain per calf of 14.8 lbs. for the 16-week period, while in a second trial they made 12.6 lbs.

Another lot of calves, which were fed whole milk for the first four weeks and then gradually changed to a ration consisting of an average of 2 gal. of separated milk and 0.75 lb. of crushed oats, together with hay and linseed cake, made during one trial an average weekly gain of 12.7 lbs. per head and during a second trial 12.1 lbs. A third lot of calves which were fed an average of 2 gal. of separated milk and 0.5 lb. of maize meal per calf per day, together with hay and linseed cake, made average weekly gains of 12 lbs. per head during one trial and of 12.1 lbs. during a second trial.

A fourth lot of calves was fed an average of 1.75 gal. of whey and 2 lbs. of calf meal per calf per day. The calves did not care for the whey and it had a tendency to scour them. These calves made an average weekly gain of 9.5 lbs. per calf during one trial and of 9.7 lbs. in a second trial. This ration was in no way as satisfactory as the others.

Excellent results were obtained from the separated milk with either crushed oats or maize meal, fed as gruel, and it is stated that if separated milk is available it is doubtful if anything better is needed.

Methods of handling sheep in California, F. A. Ellenwood (*Nat. Wool Grower, 6* (*1916*), *No. 1, pp. 19–22*).—Results of experiments are given which show more rapid gains by hot-iron docked lambs than by knife docked lambs.

Lambing methods in national forests of Southwest, R. R. Hill (*Nat. Wool Grower, 6* (*1916*), *No. 3, pp. 7–10, figs. 2*).—The author compares the open-range and the pasture and corral methods of lambing.

It has been found that the open-range method of lambing is not economical on the mountain ranges of the national forests in the Southwest. The best method of lambing is, theoretically, in coyote-proof pastures, but in practice the best method to adopt on the average allotment in the Southwest is to lamb in corrals and pastures in connection with the open range. The advantages of the improved methods of lambing over the open-range method are (1) an increase of from 3 to 7 per cent in the number of lambs secured; (2) improved conditions for the development of the lamb during the most critical period of its life; (3) a net saving of approximately 20 cts. per head on the ewes to lamb; and (4) the protection of the season's growth of forage, insuring that it will be available for lambing when needed.

The cost of constructing all improvements necessary for lambing a band of 1,000 ewes should not exceed $1,000. The amount of range required for such a band during the five-week lambing period would vary from 3 to 5 sections, according to the character of the forage and the general topography. The number of acres that should be inclosed would vary from 140 to 200 acres. The pasture and corral method of lambing is well adapted to any sized outfit and to any ordinary type of range commonly used for lambing in the Southwest.

Improved management of national forest stock, W. C. Barnes (*Nat. Wool Grower, 6* (*1916*), *No. 1, pp. 23–27*).—This is a discussion of some of the principal problems which have been investigated by the grazing division of the Forest Service of the U. S. Department of Agriculture. It includes the open herding system of sheep grazing, pasture and sheds for range lambing, grazing

sheep without water, deferred and rotation grazing, and general improvement of the grazing areas.

Corriedale sheep record association (*Breeder's Gaz., 69* (*1916*), *No. 7, p. 374*).—Announcement is made of the organization of the American Corriedale Association. This association will maintain a flock book for all Corriedale sheep tracing in an unbroken line through both parents to Corriedale flocks recognized by the Sheep Breeders' Association of New Zealand.

A demonstration test of swine rations (*Breeder's Gaz., 69* (*1916*), *No. 5, p. 243, fig. 1*).—In a demonstration test at the Indiana Experiment Station showing the value of supplementary corn for fattening hogs, 2 hogs from each of 3 lots of 10 79-lb. pigs were butchered after a 70-day test and the carcasses displayed. Lot 1, receiving corn alone, averaged during the 70-day period 20 lbs. gain per head, costing 8.64 cts. per pound of gain; lot 2, on corn and tankage, 94 lbs. gain, costing 3.92 cts. per pound; and lot 3, on corn and buttermilk, 128 lbs. gain, costing 4.08 cts. per pound.

Clover meal as a feed for swine, A. Zur Horst (*Deut. Landw. Tierzucht, 20* (*1916*), *No. 2, pp. 10–12*).—A ration composed of clover meal, potatoes, meat meal, acorns, and beets proved a very satisfactory feed for fattening swine.

A study of hog profits and losses (*Wallaces' Farmer, 41* (*1916*), *No. 5, p. 155, fig. 1*).—A graphic illustration is given of the fluctuation of hog prices over a period of twelve years, with the corresponding profit or loss to the producer.

Meat and blood meal as a supplement to oats for horses, Westmattelmann (*Deut. Tierärztl. Wchnschr., 24* (*1916*), *No. 8, pp. 69, 70*).—Successful trials in feeding 10 lbs. per day per horse of a mixture of 20 lbs. of dried stomach contents, 20 lbs. of blood, 20 lbs. of meat meal, 2 liters of brewery yeast, 7 lbs. of sugar, 1 lb. of salt, and 30 lbs. of oats are reported. It took several weeks for the horses to become accustomed to the feed, but after this time they put on weight and muscle. A ration composed of 2 lbs. of meat meal, 2 lbs. of oats, 3 lbs. of sugar, and 3.5 lbs. of bran per head per day also gave satisfactory results.

Breeding and training of the horse, G. Bonnefont (*Élevage et Dressage du Cheval. Paris: J. B. Baillière & Sons, 1914, 2. ed., pp. 440, figs. 228*).—This book treats of the breeding and management of the various breeds of light and draft horses and of their training for harness, draft, and army purposes.

Mechanics applied to the race horse, H. Couste, trans. by E. B. Cassatt (*New York: 1916, pp. 80, pl. 1, figs. 10*).—This is a translation of the second edition of this work and treats of the conformation of the race horse and the mechanics involved in the various gaits and in jumping.

The sensation of the Percheron world (*Breeder's Gaz., 69* (*1916*), *No. 6, pp. 309, 310, figs. 2*).—An account of the recent deal in which a half interest in the 11-year-old Percheron stallion Carnot is reported to have been sold for $20,000. The history of this well-known stallion is given.

The Missouri Poultry Experiment Station, T. C. Patterson (*Breeder's Gaz., 69* (*1916*), *No. 7, pp. 367, 368, figs. 10*).—A discussion of the situation, equipment, and work of the Missouri State Poultry Experiment Station, at Mountain Grove, Mo.

From observations for several years of egg-laying contests the author believes that more depends on the strain than on the variety, for it is not uncommon with two pens side by side of the same variety for one to average perhaps 180 eggs per hen, while the other pen averages only 80 or 90 eggs. The difference seems to be that one man has carefully selected and bred for egg production, while the other has not. Another point of importance is the uniformity of size, shape, and color of the eggs. The strain seems to influence this as much as the number of eggs produced.

Contrary to popular belief, the heaviest layers were the lightest eaters, and the hen laying the greatest number of eggs consumed the smallest amount of feed. It seems to be the hen's ability to utilize the feed she eats as much as the quantity eaten. The balancing of the ration also evidently has much to do with egg production.

It has been found that the color of a fowl does not influence egg production. One Buff Leghorn pullet laid more than 200 eggs in one year—more than all others in her class. The week before the contests began she was entered in a poultry show and was the highest-scoring bird in her class. One reason for the belief that high-producing hens are rough and ugly is that they usually are viewed and pictured after the year's work is done. At the beginning of the the contest many of the high producers were high-scoring.

It is stated that the popular theory that the larger birds lay large eggs is incorrect. Where all the eggs were weighed it showed that the Ancona, which is smaller than the Leghorn, laid the largest egg of all the breeds tested. Another theory is that the medium-sized or all-purpose breeds do not lay as many eggs as the egg breeds, like the Mediterraneans. One reason given is that the all-purpose breeds lose time brooding, but the records show that the Wyandottes laid the greatest number of eggs and also went broody the greatest number of times.

Can selection cause genetic change? W. E. Castle (*Amer. Nat., 50 (1916), No. 592, pp. 248–256*).—This is a continuation of the discussion previously referred to (E. S. R., 34, p. 564) on fecundity in the domestic fowl and the selection problem.

A feminized cockerel, H. D. Goodale (*Jour. Expt. Zool., 20 (1916), No. 3, pp. 421–428, figs. 7*).—A Brown Leghorn chick was castrated by making an incision on each side and carefully removing the testes. Particular care was taken to see that all testicular matter was removed. Just previous to the operation on this bird the ovaries had been removed from two pullets of the same strain belonging to the same brood and placed in moist cotton. They were cut in several pieces and dropped into the abdominal cavity of the cockerel on each side. No attempt was made to suture the pieces in place.

The bird developed a general feminine appearance except that it grew somewhat long-legged and rangy, as a cockerel would do. The spurs remained undeveloped a long time. When the adult plumage came in it lost some of its nondescript character and in most sections was clearly that of the normal female. The chief difference lay in the feathers of the dorsal regions, which were black with relatively few minute brown spots instead of the uniform mixtures of minute dull black and brown spots characteristic of the Brown Leghorn female.

Later the bird was killed and the autopsy showed the following findings: Weight, 3 lbs. 7 oz.; oviduct not found, nor were vasa deferentia; spleen hypertrophied; very little body fat; bursa fabricii not found. Ovarian tissue was found in the following positions: On the left side one piece was attached to the body wall, ribs, and transverse septum and inclosed in a serum-filled sack. The ova were very small, not more than a millimeter in diameter. A second mass lay on the surface of the kidney just lateral to the junction of the iliac with the vena cava. Four of the pieces placed on the right side were found to have become attached, three of them in the form of elongated masses, one attached to the ribs, another to the transverse septum and liver, while the third was attached to the mid-dorsal mesentery at the level of the adrenal. The fourth had adhered to the outer body wall. Some of the ova on this side reached 3 mm. in diameter. There were no evidences of empty follicles. The blood supply of the pieces of ovum on this side was well developed.

It is the opinion of the author that "the difference between the secondary sexual characters of the sexes can not be ascribed solely to the internal secretions, but that the genetic basis of each character must also be taken into consideration. At least four groups of characters can be recognized: Head furnishings, dependent in the male upon the testes, in the female independent of the ovary in certain respects, in other respects dependent; spurs independent of testes, but on which the ovary exerts an inhibition, often incomplete; voice and behavior, which in the male is partially dependent and partially independent of the testes, yet closely correlated with these; and plumage, which is independent of the male organs, but on which the ovary exerts a modifying influence.

"Since the male may be feminized, it follows that if the ovary be considered an inhibitor merely, then the male must possess both potentialities for the secondary sexual characters and that the ovarian secretion suppresses the male character, allowing the female plumage to develop. Genetically, then, the male secondary sexual characters must be considered dominant to the female. On the other hand, if the ovarian secretion be considered a modifier, transforming the male character into the female, we need not assume that both potentialities exist in the male, but only the one. We may also make a similar assumption for the normal female. At present it is impossible to determine whether or not the ovarian secretion is an inhibitor or modifier."

The feeding of young chicks on grain mixtures of high and low lysin content, G. D. Buckner, E. H. Nollau, and J. H. Kastle (*Kentucky Sta. Bul. 197 (1916), pp. 3–21, figs. 16; Amer. Jour. Physiol., 39 (1915), No. 2, pp. 162–171, pl. 1*).—Two lots of chicks were fed eight weeks, lot 1 receiving a mash twice a day, morning and evening, consisting of equal parts by weight of finely ground wheat, wheat bran, sunflower seed, and hemp seed, moistened with sour skim milk, and once a day at noon they were given a coarsely-ground grain mixture of wheat, hemp seed, and cracked corn. Lot 2 received a mash consisting of finely-ground barley, rice, hominy, and oats, 100 gm. each, and 56 gm. of gluten flour, and prepared with protein-free milk, and at noon a mixture of equal parts of barley, rice, and hominy. The lysin content of the ration fed to lot 1 was 3.8 per cent of the total nitrogen for the mash and 2.23 per cent for the grain; lot 2, 0.5 per cent for the mash and 0.79 for the grain.

Five of the chickens of lot 1 at the conclusion of the experiment weighed 2,553 gm., whereas 7 chickens in lot 2 weighed 1,195 gm. There were marked differences in the feathering of the two lots of chickens, lot 1 showing the feathering characteristic of the mature chicken, whereas lot 2 still showed the feathering of the young and immature chick at the conclusion of the experiment. Great difference in the two lots of chickens was also shown in their general activity during the progress of the experiment, the chickens of lot 1 being greatly more active than the chickens of lot 2. It was also observed that the chickens of lot 2 consumed more charcoal than the chickens of lot 1.

It is stated that the desire showed by the young chick for hemp seed is remarkable. It has been observed that out of a grain mixture containing this material they will pick out every hemp seed before eating the remainder of the ration. Of all the substances used in the feeding experiments hemp seed is richest in lysin.

The lots were then reversed, the chickens of lot 2 receiving the ration of lot 1 and lot 1 the ration of lot 2. At the end of a week the chickens of lot 2 were found to weigh 1,539 gm., an increase in seven days of 41.2 gm. per chick, as compared with an average gain per week of 15.9 gm. during the regular period of the experiment. It is stated that this rapid increase in

weight indicates that while growth was stunted on the first ration the chickens still possessed the power to grow rapidly on the ration of lot 1. The difference in the nutrition in these two lots of chicks is deemed due, in all probability, to the difference in the amount of lysin received by the two lots, and possibly to a difference in the quantity and nature of the fats contained in the two rations. The mash fed to the chicks of lot 1 contained 13.08 per cent of fat, and the dry grain mixture 8.21 per cent, whereas the mash fed to the chicks of lot 2 contained only 1.8 per cent of fat and the grain mixture 1 per cent.

In order to determine to what extent the difference shown by the two lots was due to difference in the protein or fats two lots of chicks were fed for 60 days the same rations as in the foregoing experiment except that to the ration supplied to lot 2 there was added sufficient butter fat to bring the fat content up to that of the ration fed to lot 1. The chickens of lot 1 showed an average gain per chick of 277.3 gm. over the chickens of lot 2. The differences shown by these two lots of chicks at the end of the feeding period were very striking. The chickens of lot 1 were strong, growthy, and perfectly feathered in contrast to the chicks of lot 2, which, although in perfect health, were markedly stunted in their growth and showed the feathering characteristics of a much younger chick and the yellow color and appearance of the newly-hatched chick about the head and neck. The external sexual characteristics of these two lots also showed most striking differences. In lot 1 the cockerels were easily distinguished from the hens and both showed well-developed, highly colored gills and combs, whereas the chicks of lot 2 showed no well-developed external sexual characteristics whatever, the combs of both sexes being rudimentary and colorless.

These two lots were reversed, as in the first experiment, and the average percentage gains of lot 1 were 5.1 against 28.9 for lot 2. Within one week after reversing the rations fed to lots 1 and 2 the external sexual characteristics of the chicks of lot 2 became noticeable, and at the end of three weeks were very pronounced.

It is deemed evident from these results that the marked differences shown by these two lots of chicks in the rate of growth and development can not be ascribed to the fat content of the two rations, but rather to differences in the amino-acid content of the two rations and in all probability to differences in the lysin content.

When to feed the baby chick, B. F. Kaupp (*North Carolina Sta. Bul. 235 (1916), pp. 13–15, figs. 7*).—Studies were made to determine how much of the abdominal yolk was absorbed in the embryonic stage in the shell, or in other words, to determine how much food was left in the abdominal yolk at hatching.

The weights were taken of 1,454 White Leghorn eggs, the average being 57.7 gm. By boiling the egg and weighing it was found that the average weight of 10 yolks was 17.78 gm. In a study of ten baby chicks that had started to pip out of the shell but had died, it was found that the unabsorbed yolk weighed, on an average, 8.5 gm., or 47 per cent unabsorbed. There appeared to be no constant definite weight of the amount of yolk left in the yolk sac unabsorbed at this period of the chick's life. The weights varied from 8 to 10 gm., and it was found that the rate of absorption of the yolk varied in different individuals.

Forty chicks were killed by the aid of chloroform at different ages, skinned, and the carcasses immediately placed in a 10 per cent solution of formaldehyde. Later these carcasses were sectioned longitudinally for the purpose of making a study of the relation of visceral organs with respect to the abdominal yolk sac.

From this study it was concluded that nature has made ample provision in supplying a generous store of food to keep the baby chick well nourished until the brood has hatched, and that this supply of nutrients is sufficient to carry nutrition on until the bird becomes strong. "From the study of the rapidity of absorption of the abdominal yolk it appears clear that if baby chicks be fed as soon as hatched there is likely to be trouble. If the stomach, gizzard, and intestines become gorged with food it is certain to place more or less pressure on the abdominal nerves and blood and lymph vessels, and thus the function of these vital structures will be interfered with and in some cases cause death."

Five experiments were run in which the baby chicks were left in the nursery tray until they were 72 hours old. They were then placed in outdoor brooders and given nothing but buttermilk to drink for the next 24 hours, and during the next 24 hours (the fifth day) were given only two light feeds with the milk. On the sixth day they were placed on full feed. These chicks throve better and were stronger and more resistant to chick troubles than their controls.

It is suggested that in the case of sitting hens it is advisable to give milk the first day after taking the hen from the nest and light feed for the next two days, after which the chicks may be placed on full feed with safety.

By using the combination sitting and brooding coops the hen may be fed from a high can, such an an oyster can, and the baby chicks fed in their compartment, as desired and without being interfered with by larger fowls or the mother.

Poultry raising in Wisconsin, J. G. Halpin and J. B. Hayes (*Wisconsin Sta. Bul. 261 (1916), pp. 3–35, figs. 13*).—A popular discussion of methods of poultry raising under Wisconsin conditions.

Ostrich breeding, A. Sokolowsky (*Berlin. Tierärztl. Wchnschr., 32 (1916), No. 4, pp. 37–41, figs. 3*).—Methods of breeding, feeding, care, and management of ostriches in German Southwest Africa are described.

A successful experiment in skunk farming, H. D. Jones (*Sci. Amer., 114 (1916), No. 14, pp. 346, 366, figs. 5*).—An account of methods adopted in conducting a skunk farm as a profitable business enterprise.

DAIRY FARMING—DAIRYING.

Feeding experiments with dairy cattle, H. Goldschmidt (*Tidsskr. Landökonomi, No. 4 (1915), pp. 180–196; abs. in Zentbl. Agr. Chem., 44 (1915), No. 7, pp. 334–336*).—This article reports experiments in the economical feeding of dairy cattle in Denmark, in which the value of oil cake, molasses feed, beets, and straw was demonstrated.

The utilization of beets in cattle feeding, L. Malpeaux (*Vie Agr. et Rurale, 6 (1916), No. 2, pp. 27–33, figs. 4*).—In feeding experiments with dairy cows it was found that the feeding of whole beets produced a somewhat larger yield of milk and milk fat than when chopped beets were fed, this increase probably being due to more complete mastication and utilization.

The utilization of cassava flour in the feeding of dairy cattle, J. E. Lucas (*Bul. Econ. Gouvt. Gen. Madagascar, 15 (1915), I, No. 1, pp. 67–71*).—The partial substitution of cassava flour in the ordinary grain ration for dairy cattle resulted in an increased milk and milk fat yield and in a greater live weight of the animals so fed.

The value of cod liver meal as a dairy cattle feed, H. Isaachsen, E. Fridrichsen, A. Lalim, and Ingeborg K. Wold (*Ber. Foringsförsoks Stat. [Norges] Landbrukshöiskolen, 9 (1913–14), pp. 1–52, figs. 5; abs. in Zentbl. Agr. Chem., 44 (1915), No. 7, pp. 330–333*).—The composition of cod liver meal is given as dry matter 92.53, protein 50.69, fat 31.43, ash 2.52, and other constituents 7.89

per cent. The feeding of this material to dairy cattle resulted in increased milk and fat yields.

The feeding of sesame cake to dairy cattle, R. GIULIANI (*Ann. Ist. Agr. [Milan], 12 (1913–14), pp. 1–69*).—Experiments in the feeding of sesame cake to dairy cattle resulted in increased milk and fat yields. Butter was produced sooner and at a lower temperature from cream from cows fed sesame cake than from those fed linseed cake. The Polenske and Reichert-Meissl numbers were lowered.

The work of the agricultural colleges and experiment stations in its relation to a better milk supply, W. A. STOCKING (*Milk Dealer, 5 (1916), No. 6, pp. 20–23, fig. 1*).—This paper has been previously referred to (E. S. R., 33, p. 702).

Data collected in inspection work in Ithaca, N. Y., are presented. It is shown that at the beginning of the inspection work in 1907, 98 farmers were producing milk for the city. Of this number, 31 had milk houses, 4 used a small-top milk pail, and 1 used a damp cloth for wiping the udder just before milking. In 1914 there were 124 producers, of whom 62 had suitable milk houses, 60 used small-top milk pails, and 12 used a damp cloth. During all this period, it has been the purpose of the inspectors to give as much assistance as possible, both to producers and dealers, and improvements made are attributed to friendly cooperation and assistance.

Milk and cream contests, E. KELLY, L. B. COOK, and J. A. GAMBLE (*U. S. Dept. Agr. Bul. 356 (1916), pp. 23*).—The subjects discussed in this bulletin are national contests, how contests are conducted, educational features, exhibitions, average scores of recent contests, and benefits of milk contests to dairymen. Suggestions are given for the production of contest milk.

[Use of milk and milk products] (*Cong. Rec., 53 (1916), No. 87, pp. 6039–6042*).—This reviews statements from various dairy experts, agricultural authorities, farm journals, and newspapers on the condition of the milk supply in this country and the need for more effective inspection and legislation.

Experiments in pasteurizing milk by means of the "universal pasteurizer" in Denmark, A. V. LUND (*Ber. K. Vet. og Landbohöjskoles Lab. Landökonom. Forsög [Copenhagen], 86 (1914), pp. 56–72, fig. 1; abs. in Internat. Inst. Agr. [Rome], Mo. Bul. Agr. Intel. and Plant Diseases, 6 (1915), No. 7, pp. 986–988*).—In Denmark, under the law dealing with the combating of tuberculosis in domestic animals, the pasteurization is obligatory of all skim milk and buttermilk given to cattle, so that it gives a negative reaction to Storch's test (E. S. R., 10, p. 384); i. e., the milk must be heated to at least 80° C. The apparatus often used is the so-called "universal pasteurizer," a regenerative heating apparatus in which the milk, after being heated, is cooled before leaving the pasteurizer.

In experiments it was found that if the milk from an ordinary pasteurizer has, on reaching the weighing receptacle, a temperature that would allow a positive reaction to Storch's test, the capacity for such reaction can be neutralized by the subsequent admission into the vessel of superheated milk. This, however, can not happen if the milk comes from the "universal pasteurizer" or similar apparatus, hence if milk capable of giving a positive reaction enters the weighing receptacle it retains that capacity in spite of any subsequent rise, however great, in the pasteurizer itself. The reading of the thermometer on the "universal pasteurizer," taken at the same time as the sample, thus affords no evidence as to how the milk in the weighing receptacle will react. A relatively small quantity of milk capable of positive reaction can, when added to the milk in the weighing receptacle, cause the latter to react.

Hence, as mixing is continually taking place, the milk in the receptacle can give a positive reaction a considerable time (even several hours) after the actual milk capable of causing the reaction has emerged from the pasteurizer.

As the various milk particles probably have somewhat different temperatures when they reach the top of the "universal pasteurizer," and the thermometer can only register one temperature at a given moment, the latter must always be higher than the critical temperature of the reaction (from 80° to 81°) in order that the least warmed particles of the milk, and consequently the whole bulk of the milk, shall not give a positive reaction. For this reason the maker now makes a point of mentioning in the directions for using his apparatus that the thermometer should always register at least 83° if the milk is to pass Storch's test. It is thought that this precaution will be all that is needed, and the working of the machine is not affected thereby. The rapidity with which the milk cools after being heated seems to have no effect upon its reactive capacity.

The milk of Jersey cows and of goats behaved in a precisely similar manner to that of Danish cows in respect to its reaction to the Storch test.

The control of the degree of acidity, the catalase, and the reductase by biorization, W. D. KOOPER (*Molk. Ztg.* [*Hildesheim*], *29* (*1915*), *Nos. 76, pp. 959–961; 77, pp. 973, 974*).—Data are presented which indicate that biorization materially reduces the formation of acid in milk, destroys bacteria, and improves the keeping quality of milk.

Experiments in cheese making from milks of different fat contents, A. V. LUND (*Ber. K. Vet. og Landbohöjskoles Lab. Landökonom. Forsög* [*Copenhagen*], *86* (*1914*), *pp. 73–97; abs. in Internat. Inst. Agr.* [*Rome*], *Mo. Bul. Agr. Intel. and Plant Diseases, 6* (*1915*), *No. 7, pp. 988–990*).—In cheese investigations it has been found that the coefficient of the cheese, i. e. the relation between the fat content and the casein content, can be very accurately estimated from the fat percentage of the "cheese milk" and, conversely, that the fat percentage can be calculated from the coefficient. The factor to be used in the case of the milk of ordinary Danish cows is 37.5.

It follows that the coefficients of the different kinds of cheese known commercially as whole-milk cheese, half and quarter whole-milk cheese, and skim-milk cheese are sufficiently distinct to allow of the various kinds being distinguished by this means. In spite of the very considerable variations in the values of the same sort of cheese it has been found that the minimum values found for whole-milk cheeses are higher than the maximum values for half whole-milk cheeses, while the minimum values for the latter are in their turn higher than the maximum values of quarter whole-milk cheese, and so on. Such factors as whether the cheese is made with pasteurized or unpasteurized milk, and whether the curd is coarsely or finely divided, exert some influence upon the coefficient of the cheese, but not to the extent of appreciably modifying the above conclusions.

The coefficients remain almost the same whether the cheese analyzed is fresh or has been kept some time. The method of storing also has little effect upon the coefficients as determined by analysis. As the coefficients determined by the experiments are merely experimental figures, and do not correspond to the conditions obtaining in practical cheese making, in trade, or at exhibitions, they can not be used as type values, but may serve as guides for the determination of the latter.

The yield of cheese can be roughly estimated when the amount of fat and casein in the cheese milk is known. Cheeses made from the milk of Jersey cows were found to have higher coefficients than those made from the milk of

ordinary Danish cows; yet the coefficients of the former were relatively too low, owing to the large amount of casein in the milk of Jersey cows. In the case of the milk of the Jersey cow the factor 37.5 given above must be replaced by the factor 30. The milk of Jersey cows gave a much larger cheese yield than ordinary milk, this being due to the larger fat and casein content of the former. Judging from a single examination there is no characteristic difference between the quality of cheese made from the milk of Jersey cows and that made from the milk of ordinary Danish cows.

Any given cheese milk can be altered by the addition of skim milk or whole milk (or even cream) in such a way as to obtain the desired coefficient in the cheese to be produced.

VETERINARY MEDICINE.

Lymphatic glands in meat-producing animals, P. Godbille, trans. by A. F. Liautard and D. A. Hughes (*New York: William R. Jenkins Co. [1915], pp. 175, figs. 17*).—The first part of this work (pp. 17–109) deals with the topographic anatomy of the lymphatic glands in food-producing animals, including cattle, swine, sheep, and horses, and the second part (pp. 111–164) with the normal appearance of these glands in meat-producing animals and the pathological alterations occurring in them.

A practicum of bacteriology and protozoology.—I, Bacteriology, K. Kisskalt (*Praktikum der Bakteriologie und Protozoologie. I, Bakteriologie. Jena: Gustav Fischer, 1914, 3. ed., pp. VIII+112, figs. 40*).—The third edition of the first part of this compend, previously noted (E. S. R., 26, p. 882).

Yearly reports in regard to the progress made in veterinary medicine, edited by W. Ellenberger, W. Schütz, and O. Zietzschmann (*Jahresber. Vet. Med., 33 (1913), pp. V+423; 34 (1914), pp. VII+297*).—These reports covering the years 1913 and 1914 are in continuation of that previously noted (E. S. R., 29, p. 581).

Wound treatment, L. A. Merillat, E. W. Hoare, et al. (*Chicago: Amer. Jour. Vet. Med., 1915, pp. 186*).—This work consists of articles on wounds and wound treatment by a number of authors.

Antiseptic methods employed in the treatment of infected wounds based on a bacteriological examination of the pus, Cazin and Mlle. S. Krongold (*Compt. Rend. Acad. Sci. [Paris], 162 (1916), No. 2, pp. 89–91*).—In the treatment of wounds, in which *Bacillus pyocyaneus*, staphylococcus associated with various diplococci, and other common bacteria were found, a solution of silver nitrate (1:200,000) yielded the most satisfactory results. For suppurative, gangrenous wounds in which *B. perfringens*, tetragenes, anaerobic streptococci, *B. coli*, and others were found, hypochlorite solutions were necessary. The solutions used were those prepared according to Dakin's method and the water of Javelle. The latter gave the best results in a concentration of 15 gm. per liter of distilled water, stronger solutions being found to produce irritation of the skin after prolonged use. Dakin's hypochlorite solution was not as strongly bactericidal as the water of Javelle, but does not irritate the skin and can be used continuously for several weeks. Favorable results are also reported with the polyvalent serum of Leclainche and Vallée.

The germicidal power of glycerin on various micro-organisms under various conditions, E. H. Ruediger (*Philippine Jour. Sci., Sect. B, 9 (1914), No. 6, pp. 465–477*).—"Glycerin has a distinct, although feeble germicidal action. The germicidal action varies greatly with the temperature, being much feebler at a temperature of 15° C. than at from 30 to 35°. The germicidal action varies

with the diluent employed; in glycerin diluted with physiologic salt solution the micro-organisms died much sooner than in glycerin diluted with bouillon or with horse serum. In dilutions up to 50 per cent, glycerin did not destroy the bacillus of anthrax in 15 days. This may be due to the presence of spores. Glycerin seems to be a selective poison for the bacillus of plague, the spirillum of cholera, and the bacillus of diphtheria. In 50 per cent of glycerin in physiologic salt solution all the nonspore-forming organisms died in less than 4 days."

Changes of bacteria on the animal body (*Centbl. Bakt.* [*etc.*], *1. Abt., Orig., 74 (1914), No. 3–4, pp. 285–294; 75 (1914), No. 2, pp. 159–173; 75 (1915), No. 5–6, pp. 394–398; 76 (1915), Nos. 1, pp. 38–46; 5, pp. 330–342*).—The present papers, in continuation of a series on the subject, include an experiment on the formation of the capsule of the anthrax bacillus, by K. Rotky (pp. 285–294); the correlation between capsule formation, spore formation, and infectivity of the anthrax bacillus, by O. Bail (pp. 159–173); experiments on the power of resistance of capsulated and capsule-free anthrax bacilli, by J. Matsui (pp. 394–398); investigations of capsule-free anthrax, by O. Bail (pp. 38–46); and tests of the attenuation of the anthrax bacillus at 42°, by O. Bail (pp. 330–342).

Complement fixation in varicella, J. A. Kolmer (*Jour. Immunol., 1 (1916), No. 1, pp. 51–58*).—While the experiments reported have shown that "an antibody in the nature of an amboceptor is present in the sera of persons suffering with varicella which will absorb complement in the presence of an antigen prepared of the cutaneous lesions of this disease, yet the percentage of positive reactions and particularly the degree of complement absorption is small. While immunity principles are in all probability present in the body fluids of persons for years after an attack of varicella these could not be detected by the complement-fixation tests in this study. All positive reactions were observed during or soon after an attack of the disease and at the time of probable highest concentration of antibodies. A more delicate technique would probably yield a higher percentage of positive reactions as is usual in all complement-fixation tests with bacterial antigens, but in this study this was avoided in order to guard against the possibility of nonspecific absorption of complement."

Complement fixation in vaccinia and variola, J. A. Kolmer (*Jour. Immunol., 1 (1916), No. 1, pp. 59–81*).—Experiments reported show that about 60 per cent of the sera examined from patients suffering with mild smallpox yielded positive complement-fixation reactions with salt-solution antigens of variolous and cowpox viruses. Although the reactions in general were relatively weak those with the variolous antigens were somewhat stronger than those with the cowpox antigens. Alcohol extracts of variolous and cowpox viruses possessed little or no antigenic sensitiveness.

"These complement-fixation reactions have demonstrated the close biological relationship between the antibodies of vaccinia and variola; it is probable that complement-fixation reactions with salt-solution antigens of the contents of smallpox lesions or fresh cowpox virus will prove of some value in the diagnosis of smallpox."

The fate of various antibodies in the precipitin reaction, F. P. Gay and Ruth L. Stone (*Jour. Immunol., 1 (1916), No. 1, pp. 83–104*).—The authors were unsuccessful in an attempt to separate out antibodies in a condition relatively free from other proteins. Their experiments have shown that most bacteriolysins and hemolysins, when associated either with the precipitinogen serum or with the precipitin serum, are not carried down in the precipitate. Similar negative results were obtained with artificial bacterial agglutinins and hemagglutinins. When the precipitate was produced by adding serum to

its antiserum the fixation complex was generally shown to be present in the precipitate. The fixation complex may, however, be present in the supernatant fluid, and was in most instances so found when a bacterial extract was added to an immune serum.

"In certain combinations it seems definitely shown that the fixation complex is present in that fraction (supernatant or precipitate) in which the protective bodies are absent. Thus in the case of pneumococcus precipitate produced by adding the extract of pneumococcus to antiserum from the horse, the protective bodies are present in the precipitate and the fixation complex is present in the supernatant fluid. The exact reverse is true in a combination of rabbit antihorse serum and horse antipneumococcus serum."

A bibliography of 28 references is appended.

Kidney lesions in chronic anaphylaxis, T. H. BOUGHTON (*Jour. Immunol., 1 (1916), No. 1, pp. 105–118, figs. 5*).—Material examined from 23 guinea pigs demonstrated that "repeated anaphylactic shock induced . . . by injections of egg white or beef serum is able to produce lesions of the kidney that are not produced by acute anaphylaxis, nor by the repeated injection of these proteins in refractory animals. These lesions consist principally of necrosis of tubular epithelium, proliferation of glomerular capillary endothelium, and swelling and degeneration of the intima and media of small vessels. Small diffusely scattered areas of round-celled infiltration were observed in nearly all cases, somewhat similar to the areas observed in the controls, but usually larger, and invariably much more numerous than the spontaneous lesions. In this series the lesions noted are to be considered as subacute rather than chronic."

Biological researches on the eosinophils, M. WEINBERG and P. SÉGUIN (*Ann. Inst. Pasteur, 28 (1914), No. 5, pp. 470–508, pls. 2*).—From the investigation the authors have shown that the eosinophils, as well as the other white cells, possess chemotactic properties for certain toxic substances, as well as the original parasite, to an even greater extent than the other leucocytes. When the "eosinotactic" substances are absorbed in the infected tissue they cause a stimulation to the production of a large number of eosinophils and thus produce a local eosinophilia. This local action does not depend entirely on the toxic substance or parasites, but more especially on the number of eosinophils in the blood of the experimental animal. When they are present in great numbers the eosinotactic substances apparently cause an afflux of polynuclear neutrophils. This result has also been obtained by injecting helminth products in the conjunctival tissue of the horse or in the muscle of the guinea pig. Intraperitoneal injection of such toxins into guinea pigs does not produce an afflux of eosinophils from the blood in the peritoneal exudate, since the eosinophils are arrested in the neighboring tissues of the peritoneum and thus constitute a local eosinophilia.

The intense local eosinophilia observed in the phenomenon of Arthus, attributed by some investigators to the chemotactic action of the eosinophils, has not been definitely determined. Injection into the peritoneal cavity does not produce a local eosinophilia in the lungs of the animal which survives the anaphylactic shock. The pulmonary eosinophilia, which is considered as a characteristic lesion of nonfatal anaphylaxis by some, preexists to a large extent as an eosinophilia in the blood. Such a condition manifests itself about 15 minutes after the injection of a sensitized guinea pig, and is considered a natural consequence of anaphylaxis. The direct action of the antigen on the hematopoietic center seems thus to be explained.

Biological researches on the eosinophils, II, M. WEINBERG and P. SÉGUIN (*Ann. Inst. Pasteur, 29 (1915), No. 7, pp. 323–346, pls. 2; abs. in Jour. Roy.*

Micros. Soc., No. 5 (1915), p. 508).—Continuing the investigation noted above, the authors have shown that the eosinophils possess phagocytic properties and are not only capable of ingesting inert material and bacteria but also protozoa and erythrocytes. The results obtained with *Bacillus subtilis*, *B. coli*, certain protozoa, and the red cells indicate that they are not only ingested but also completely digested. The eosinophilic phagocytosis takes place both in vitro and in vivo (peritoneal cavity, subcutaneous tissue, and circulating blood of the guinea pig).

When the eosinophils are very abundant in the blood, or when they accumulate at the point of inoculation, they play a very important part in the immediate protection of the organism against infection. When placed in contact with the fluid from a hydatid cyst for 1 hour at 37° C. they lose their phagocytic properties, while the neutrophils and mononuclears are still strongly phagocytic. If a sufficient number are brought in contact with such a fluid it finally loses its antigenic properties, as is easily demonstrated by the complement-fixation reaction with a fresh echinococcus serum and a normal hydatid fluid as controls. Those of immunized animals were found to absorb the hydatid antigen more readily than those of normal animals. While possessing these properties they still play only a supplementary rôle in the actual process of phagocytosis.

It is concluded that the eosinophil leucocytes, together with the polynuclear neutrophils, are an important factor in immunity. Although the principal function of the neutrophils is to protect the organism against the invading micro-organisms, the eosinophils are especially adapted for neutralizing certain toxic products. The elaboration of the specific antibodies is probably the result of the absorption of toxic products.

Toxins of intestinal parasites, D. E. PAULIAN (*Presse Méd. [Paris], No. 49 (1915), p. 403; abs. in Jour. Amer. Med. Assoc., 65 (1915), No. 22, p. 1954*).—The author's investigations have led to the conclusion that intestinal parasites act on the organism through the production of toxins which result in congestion and degeneration of tissues, loss of resisting powers of the red corpuscles, intense anemia, and eosinophilia. The nervous disturbances and even the eosinophilia may be regarded as phenomena of anaphylaxis.

The morphology of the adults of the filaria found in the Philippine Islands, E. L. WALKER (*Philippine Jour. Sci., Sect. B, 9 (1914), No. 6, pp. 483–491, pl. 1*).—The author finds that the Philippine filaria is apparently identical with *Filaria bancrofti*.

Investigations of the development of the free living generations of lungworms, COUNTESS VON LINDEN and L. ZENNECK (*Centbl. Bakt. [etc.], 1. Abt., Orig., 76 (1915), No. 2–3, pp. 147–178, pls. 4*).—Studies of several species of Strongylus are reported upon.

African coast fever, L. E. W. BEVAN (*Rhodesia Agr. Jour., 12 (1915), No. 4, pp. 468–483, pls. 7, figs. 5*).—A summarized account of the disease, with directions for dipping.

Anthrax, R. DE CASTRO Y RAMIREZ (*Estac. Expt. Agron. Cuba Bol. 25 (1915), pp. 22, pls. 4, fig. 1*).—A general account of this disease and its treatment.

Vaccination experiments against anthrax, A. EICHHORN (*Jour. Amer. Vet. Med. Assoc., 48 (1916), No. 6, pp. 669–687*).—Substantially noted from another source (E. S. R., 34, p. 579).

Investigations of foot-and-mouth disease, E. KALLERT (*Arb. K. Gsndhtsamt., 47 (1914), No. 4, pp. 591–613, pls. 4; 48 (1915), No. 3, pp. 351–380, pls. 2*).—Several papers are presented which deal with the subject as follows: (1) Importance of the von Betegh Bodies Found in Lymph of Affected Animals (pp.

591–602); (2) Contribution to the Histogenesis and Histology of the Vesicles, Particularly as Relates to the Question of the Occurrence of Inclusion Bodies in the Affected Parts (pp. 603–613); and (3) The Morphology and Biology of the Cytoryctes Cocci Reported by Siegel to be the Cause of Foot-and-Mouth Disease (pp. 351–380).

Concerning the filterability of trypanosomes, S. B. Wolbach, W. H. Chapman, and H. W. Stevens (*Jour. Med. Research, 33 (1915), No. 1, pp. 107–117*).—The authors conclude that trypanosomes from cultures and from animal tissues are not filterable through bacteria-proof filters.

The effect of daylight and drying on the human and bovine types of tubercle bacilli, L. Findlay and W. B. M. Martin (*Vet. Rec., 28 (1915), No. 1430, pp. 253, 254*).—From experimental evidence the authors have demonstrated that there is little appreciable loss of virulence of either type of the tubercle bacillus after seven days desiccation. Diffused daylight causes a definite lowering of the virulence in both types, the human type being avirulent within seven days. Under the combined influence of desiccation and diffused daylight there is a marked fall in virulence. This fall is more pronounced in the bovine than in the human type.

In general it is concluded that the bovine type is distinctly more susceptible to the effect of ordinary atmospheric influences than is the human type. Such difference may explain in part why aerial infection with the bovine type is so infrequent in the human organism.

The intracutaneous tuberculination of chickens, J. F. H. L. van Leeuwen (*Centbl. Bakt. [etc.], 1. Abt., Orig., 76 (1915), No. 4, pp. 275–288*).—From the investigation it is concluded that the intracutaneous tuberculination yields fairly reliable results in the diagnosis of tuberculosis in chickens. The turgescence which occurs after the injection is of no significance in the diagnosis, but in judging a reaction the general state of nutrition of the animal must be taken into consideration. If it is desired to reinject, the usual intermission of several weeks is not necessary as the injections may be given during or shortly after the reaction. Local anaphylaxis following a previous injection does not occur in healthy chickens. In making the test it is necessary to use avian tuberculin.

A bibliography of 21 references is appended.

The success and failure of the tuberculin test in certified dairies, C. L. Roadhouse (*Jour. Amer. Vet. Med. Assoc., 48 (1916), No. 4, pp. 420–429*).—Methods of scientific supervision in certified dairies which have given satisfactory results are outlined, and experimental results obtained from the subcutaneous and intradermal tuberculin tests are submitted. It is indicated that "the intradermal test is somewhat more searching in its diagnosis of incipient cases of tuberculosis in animals than the subcutaneous."

The diagnosis of infectious abortion in cattle by means of the Abderhalden dialysis procedure, K. Katz (*Wiener Tierärztl. Monatsschr., 2 (1915), No. 4, pp. 161–172*).—The results of the author's investigation have demonstrated that the serum of animals naturally or artificially infected with *Bacillus abortus* is capable of cleaving the protein of abortion bacilli. Normal serum does not possess this property. The dialysis procedure is, therefore, specific in infectious abortion in cattle and is valuable as a diagnostic method, the results being in almost perfect accord with those obtained by the agglutination reaction. The number of failures is no greater than the usual experimental error due to faulty technique.

The special preparation of the antigen, or substrate, is described in detail, and the experimental data are presented in tabular form. A bibliography of 34 references is appended.

A further contribution on the biology of Hypoderma lineatum and H. bovis, S. HADWEN (*Parasitology, 7 (1915), No. 4, pp. 331–338, pls. 2*).—Substantially noted from another source (E. S. R., 33, p. 775).

Trichinosis.—Report of a case with the trichina larvæ in the spinal fluid, L. BLOCH (*Jour. Amer. Med. Assoc., 65 (1915), No. 25, pp. 2140, 2141, fig. 1*).—This is a report of a case in which trichina larvæ were found in the cerebrospinal fluid. "Meningeal irritation undoubtedly exists, as is shown by the positive Nonne and Noguchi tests. Severe infections show low eosinophil count during the acute stage, which increases with convalescence."

Salvarsan treatment of infectious catarrh of the upper respiratory tract of the horse, BARTHEL (*Ztschr. Veterinärk., 27 (1915), No. 3, pp. 65–68; abs. in Vet. Rec., 28 (1915), No. 1423, pp. 167, 168*).—The author reports that successful results have followed the administration of 4.5 gm. of neosalvarsan dissolved in 100 cc. of distilled water and injected intravenously, the injections varying from one to five days after the first appearance of symptoms of the disease. Fifteen horses were thus treated and four slightly infected cases left for controls. The symptoms of the disease were very characteristic, so that it was possible to exclude strangles and equine infectious pneumonia from the diagnosis. The fever diminished in from 12 to 90 hours after injection and an improvement of the general condition appeared. The controls continued to have irregularities of temperature, pulse, and respiration for some time.

I, Some further studies of chick mortality, B. F. KAUPP (*North Carolina Sta. Bul. 235 (1916), pp. 3–11, 15*).—These pages discuss the causes of chick mortality, and report experiments undertaken to determine the effect of feeding various kinds of sour milk and buttermilk in reducing this mortality. All of the lots were raised on ground infected by *Bacterium pullorum*.

In addition to a grain mixture four lots of chicks received the following feeds: Lot 1, sour milk (clabber); lot 2, artificial buttermilk made by *Bacillus bulgaricus;* lot 3, buttermilk made from *B. acidi lactici;* and lot 4, a control lot, no milk. Diarrhea attacked the flocks, resulting at the end of the 8-week period in a 16 per cent loss in lot 1, 10 per cent in lot 2, and 12 per cent in lot 3. In lot 4 diarrhea claimed a toll of 24 per cent during the first four weeks and left the remainder of the flock in such a wrecked condition, constitutionally, that by the end of eight weeks 36 per cent had died.

In individual records of 8 White Leghorns 4 were infected with diarrhea and, although they survived at the end of eight weeks, they averaged only 0.56 lb. in weight, while those that were not attacked averaged 0.74 lb. Eleven birds were attacked by diarrhea and at the end of eight weeks averaged only 0.28 lb. each in weight, while 8 birds which were not affected by diarrhea averaged 0.47 lb. each in weight.

It is concluded that normal, artificial buttermilk, and sour milk are beneficial in baby chick feeding, serving to ward off severe attacks of diarrhea and resulting in greater gains in the chicks. The feeding of sour milk is recommended to begin as soon as the chick is taken from the incubator or nest.

The diseases of poultry, J. EHRHARDT (*Die Krankheiten des Hausgeflügels. Aarau: Emil Wirz, 1914, 3. ed., pp. VIII+69*).—A third edition of this small handbook.

RURAL ENGINEERING.

Flow through weir notches with thin edges and full contractions, V. M. CONE (*U. S. Dept. Agr., Jour. Agr. Research, 5 (1916), No. 23, pp. 1051–1113, pl. 1, figs. 24*).—Laboratory equipment and methods used are described and experiments conducted under a cooperative agreement between the Office of Experiment Stations of this Department and the Colorado Experiment Station on

notches with thin edges and full contractions to determine the accuracy of the Francis and Cipolletti formulas for notches of the sizes ordinarily used in irrigation practice are reported.

It was found that "the discharges through rectangular and Cipolletti notches when plotted logarithmically do not give straight lines and therefore can not be represented correctly by a formula of the type $Q=CLH^n$. It was found, however, in the case of the rectangular notches experimented with and the heads of water run, that a straight-line formula could be deduced that within the range of the experiments gave values quite close to the experimental data.

"The formula

$$Q=3.247LH^{1.48}-\left(\frac{0.566L^{1.8}}{1+2L^{1.8}}\right)H^{1.9}$$

gives discharge values for 1-, 1-5, 2-, 3-, and 4-ft. rectangular notches that agree within a maximum of approximately 1.2 per cent and within an average of 0.28 per cent with the curves plotted from the experimental data. The discharges throughout the 0.5-ft. rectangular notch do not follow the same law as those for the longer notches. The formula

$$Q=1.593H^{1.526}\left(1+\frac{1}{800H^{2.3}}\right)$$

gives values consistent with the curve plotted from the experimental data.

"The Francis formula gives values within approximately 2 per cent of the actual discharges, so long as the head does not exceed one-third the length of the notch. Within the limits of the experiments the formula

$$Q=3.08L^{1.022}\ H^{(1.46+0.003L)}$$

gives discharge values for the 1-, 1.5-, 2-, 3-, and 4-ft. rectangular notches that agree within a maximum of 0.7 per cent, and an average of 0.26 per cent, with the values given in the curves plotted from the experimental data. The formula $Q=1.566H^{1.504}$ gives values for the 0.5-ft. rectangular notch that agree within 1 per cent with the curves plotted from the experimental data. The curve-line formula for rectangular notches takes account of the law of variation of the discharge curves better than does the straight-line formula and, consequently, it appears that it will give closer values for higher heads and longer notches than those experimented with.

"The formula

$$Q=3.247LH^{1.48}-\left(\frac{0.566L^{1.8}}{1+2L^{1.8}}\right)H^{1.9}+0.609H^{2.5}$$

gives discharge values for the 1-, 1.5-, 2-, 3-, and 4-ft. Cipolletti notches that agree within 0.5 per cent with the curves plotted from the experimental data, except in the case of the lower heads on the 1-ft. notch, where the maximum divergence is approximately 1.5 per cent. The discharges through the 0.5-ft. Cipolletti notch do not follow the same law as those for longer notches. The formula

$$Q=1.593H^{1.526}\left(1+\frac{1}{800H^{2.3}}\right)+0.587H^{2.53}$$

represents the discharges through such a notch.

"The Cipolletti formula gives discharge values within 1.5 per cent of the actual discharges so long as the head does not exceed one-third the length of the crest of the notch. The formula

$$Q=3.08L^{1.022}H^{(1.46+0.003L)}+0.6H^{2.6},$$

which is based on the straight-line formula for rectangular notches, gives discharge values for the 1-, 1.5-, 2-, 3-, and 4-ft. Cipolletti notches that agree within a maximum of 1 per cent with the curves plotted from the experimental data, the divergences at all but a few points being 0.5 per cent or less. The formula for the 0.5-foot notch is $Q=1.566H^{1.504}+0.56H^{2.55}$. The Cipolletti type of notch does not give discharges as nearly proportional to the length of crest as does the rectangular type, consequently, . . . the rectangular-notch weir is to be preferred.

"The general formula for discharges through triangular notches of from 28° 4′ to 90°, and probably up to 109°, is

$$Q=(0.025+2.462\,S)H^{\left(2.5-\frac{0.0195}{S0.75}\right)}$$

where H is the head in feet and S the slope of the sides. Triangular notches having side slopes greater than about 1:4 (109°) are impractical, as the nappe adheres. The 90° triangular notch is the most practical triangular notch and should be used in preference to either rectangular or Cipolletti notches for discharges up to approximately 3 cu. ft. per second. The approximate formula $Q=2.49H^{2.48}$ will give discharge values for 90° notches which agree very closely with the value obtained with the general formula for triangular notches.

"The crest and sides of a weir notch need not be knife-edged. They are sufficiently sharp if the upstream corner of the edges is a distinct angle of 90° or less and the thickness of the edges is not so great that the water will adhere to them. The head should be measured upstream from the weir a distance of at least $4H$, or sidewise from the end of the crest in the plane of weir a distance of at least $2H$.

"The distances required for full contractions with rectangular and Cipolletti notches are approximately $2H$, but an additional cross-sectional area of the weir box is required to reduce the velocity of approach.

"With end contractions equal to $2H$ and a bottom contraction equal to $3H$, or end contractions equal to $3H$ and a bottom contraction equal to $2H$, the mean velocities of approach are about ⅓ ft. per second, and the discharges with medium to high heads do not agree more closely than approximately 1 per cent with the discharges computed by the formulas. The average ratio of the cross-sectional area of the weir box to the cross-sectional area of the notch required to give discharges within 1 per cent of the values obtained with the formula is greater than 7 and is probably near 15.

"In order to make the results comparable with those for rectangular notches, the end contractions for trapezoidal notches should be measured from about the middle point of the side of the notch, rather than from the end of the crest. A notch which would give discharges proportional to the lengths of the notches would probably have curved sides, the slope decreasing with the head.

"For all practical purposes, discharges through rectangular and Cipolletti notches are not affected until the notch is submerged to a depth equal to one-tenth the head upstream from the weir. Submergence equal to one-eighth the head upstream from the notch decreases the discharge approximately 2 per cent, that equal to one-fourth approximately 6 per cent, and that equal to one-third approximately 9 per cent."

Notes on the duty of water, J. W. Beardsley (*Cornell Civ. Engin., 24 (1916), No. 4, pp. 153–160, figs. 2*).—It is the purpose of this paper "to indicate some of the questions arising in a determination of the area to be developed under a given water supply, with special reference to conditions existing along the relatively dry coastal plains on the south side of Porto Rico. . . .

"The duty of water for the Porto Rico Irrigation Service, as defined by law, is '4 acre-feet per acre per annum, the said standard to be applied on the basis of fair average years.' Irrigation is carried on continuously throughout the year. The crop is practically entirely sugar cane and it is planted during both spring and fall months."

From experiments from various sources and general conditions in Porto Rico, a curve is given showing "that the value of water in percentage of yield rapidly decreases as a maximum crop is approached, and unless water is very cheap its use beyond that point will not be financially profitable. Up to about 85 per cent its use is of maximum value, thence up to 100 per cent of minimum value to the crop. . . . As the maximum tonnage is passed, the percentage of sucrose in the cane decreases more rapidly than the tonnage of yield on account of the harmful effect of surplus water and oversaturation of the soil. Also between 30 and 80 per cent yields an increase per annum of 1 in. of beneficial water gives 1.8 per cent increase in yield."

Other climatic and hydrographic data are reported "to illustrate the danger of using [such] data covering short periods of time as fair bases for technical problems and the construction of expensive structures."

The use of mud-ladened water in drilling wells, I. N. KNAPP (*Trans. Amer. Inst. Mining Engin., 51 (1916), pp. 571–586, figs. 2*).—The object of this paper "is to describe the mixing, testing, and use of mud-laden water for rotary drilling in such a way as to make them helpful to the driller, the operator, or the engineer in solving his own special drilling problems. The structures, apparatus, and tools used are indicated in a general way. . . .

"The information is the result of actual experience in drilling in Coastal Plain formations. The materials encountered in the wells drilled were unconsolidated sands, gravels, and clays, in which thin layers of sandstones, shell conglomerates, and shales began to appear at about 1,200 ft. in depth."

Irrigation in Netherlands East India (*Netherlands East Indian San Francisco Com., Dept. Agr., Indus., and Com., Essay No. 12 (1914), pp. 72, pls. 5, figs. 10*).—This pamphlet describes the climate, rainfall, and surface water supplies of Java and the distribution and extent of the rice fields of Java and Madoera, discusses the cultivation of crops needing irrigation, and sketches the history and development of irrigation in the Dutch East Indies. Brief descriptions of some of the chief irrigation works are also included. Other topics dealt with are drainage and flood protection; harmful influence of active volcanoes on irrigation works; reservoirs for irrigation purposes; development of the water management, cost of management and maintenance; expenditure and staff for irrigation purposes; results obtained from irrigation works; and irrigation in the possessions beyond Java and Madoera.

Surface water supply of north Pacific drainage basins, 1912, N. C. GROVER, F. F. HENSHAW, G. C. BALDWIN, and W. A. LAMB (*U. S. Geol. Survey, Water-Supply Paper 332 (1916), pp. XI+748, pls. 2*).—This report combines the material covered by Parts A–C, previously noted (E. S. R., 32, p. 587; 33, pp. 484, 880).

Water powers of the Cascade Range.—III, Yakima River basin, G. L. PARKER and F. B. STOREY (*U. S. Geol. Survey, Water-Supply Paper 369 (1916), pp. 169, pls. 20, figs. 12*).—This report, prepared in cooperation with the Washington Geological Survey, is based on data consisting of stream-flow records, river plans and profiles, reservoir surveys, and field reconnaissances of streams in the Yakima River basin, an area of about 5,970 square miles slightly southeast of the geographic center of Washington, continuing previous work (E. S. R., 24, p. 313; 29, p. 84).

The regulation of rivers, J. L. Van Ornum (*New York and London: McGraw-Hill Book Co., 1914, pp. X+393, pls. 6, figs. 96; rev. in Engin. News, 74 (1915), No. 25, p. 1170*).—This book considers the principles underlying the regulation of rivers. It contains chapters on commercial considerations, general phenomena, investigations, surveys, etc., methods of river improvement, the principles of regulation, works of channel contraction, the protection of erodible banks, dredging, levees, and the control of the current.

Proceedings of the eleventh annual meeting of the Iowa State Drainage Association (*Proc. Iowa State Drainage Assoc., 11 (1915), pp. 111, figs. 5*).—The following special articles are included in these proceedings:

Platting and Recording Tile Drainage Systems, by C. B. Platt; Soil Erosion, by B. Brooks; Planning and Building Farm Drainage Systems, by F. O. Nelson; Draining and Farm Units, by J. M. Wells; Drainage by Wells, by J. T. Stewart; Soil Moisture—Under Drainage and Crop Production, by W. J. Schlick; Drainage Improvements and Their Relation to Sanitary Conditions, by L. Higgins; Some Sanitary Benefits Resulting from Drainage, by W. Grant; Problems of Drainage Contractor, by H. B. Whitney; Legal Problems in Operating Under the Iowa Drainage Law, by T. P. Harrington; The National Aspect of Drainage, by E. T. Perkins; Levying Drainage Assessments, by G. R. Campbell; and Methods of Paying Drainage Engineers for Their Services, by A. G. Baker.

Proceedings of seventh annual drainage convention of the North Carolina Drainage Association, 1914, compiled by J. H. Pratt and Miss H. M. Berry (*N. C. Geol. and Econ. Survey, Econ. Paper 41 (1915), pp. 70, figs. 3*).—These proceedings contain the following special articles:

The Upbuilding of Eastern Carolina Through Drainage and the Resulting Benefits to the Railroads, by B. E. Rice; Tile Drainage, by W. E. Sherwin; The Importance of Principles of Farm Drainage, by H. M. Lynde; The Drainage and Development of North Carolina's Muck Lands, by C. W. Mengel; North Carolina Drainage Law and Some Needed Amendments, by J. H. Small; and Some New Factors in Drainage Work in North Carolina, by L. Brett.

The hydraulic ram, B. B. Robb (*Cornell Countryman, 13 (1916), No. 4, pp. 275–281, figs. 7*).—The construction and operation of single- and double-acting hydraulic rams are illustrated and described, and the results of performance tests of a typical ram operating under fixed heads, but with varying lengths of stroke of the dash valve, are graphically reported. The mathematical theory of the operation of the hydraulic ram is also briefly presented.

Electrically driven dragline scrapers dig 45-mile irrigation canal (*Engin. Rec., 73 (1916), No. 5, pp. 147, 148, figs. 3*).—Data on unit costs of excavating 1,500,000 cu. yds. of material in two seasons with two machines on the Sun River project of the U. S. Reclamation Service are given.

A comparison between bleach and liquid chlorin disinfection, C. R. Avery (*Ann. Rpt. Prov. Bd. Health Ontario, 33 (1914), pp. 142–149*).—Experiments are reported comparing bleaching powder and liquid chlorin for the disinfection of water.

The results are taken to indicate that "taking the results as a whole the advantage of what difference there is seems to lie with the bleach. This difference is small, however, and the conclusion is that if a normal water supply be treated with the same amount of available chlorin, whether from bleaching powder or liquid chlorin, and provided proper mixing takes place, the disinfection in either case will be the same."

Does alum inhibit the action of chlorin as a disinfectant? C. R. Avery and O. G. Lye (*Ann. Rpt. Prov. Bd. Health Ontario, 33 (1914), pp. 150–155*).—Experiments on the effect of alum on the action of chlorin as a disinfectant for water are reported.

The results are taken to indicate that while the addition of alum immediately causes a considerable reduction in the available chlorin content the disinfecting qualities of the bleach are not apparently affected under a period of 12 hours. The addition of alum to bleach solutions did not have the effect of lowering the bacteriological efficiency appreciably along with the reduction of available chlorin during the first 12 hours, but after this period a perceptible change in efficiency was evidenced.

"The addition of varying amounts of alum does not cause results corresponding to the amounts added. . . . The amount of chlorin in parts per million appears to be reduced in direct proportion to the amount of alum added up to a certain limit, after which the further addition of alum has little effect on the available chlorin."

American sewerage practice, L. Metcalf and H. P. Eddy (*New York and London: McGraw-Hill Book Co., 1914, vol. 1, pp. X+747, pls. 25, figs. 213; 1915, vols. 2, pp. X+564, pls. 18, figs. 163; 3, pp. XIII+851, pl. 1, figs. 229; vol. 3 rev. in Engin. News, 74 (1915), No. 25, pp. 1168, 1169*).—This treatise deals, in three volumes, with the design and construction of sewers and with sewage disposal.

The chapters of volume 1, Design of Sewers, are as follows: The lessons taught by early sewerage works; the general arrangement of sewerage systems; flow of water in pipes and channels; velocities and grades; measurement of flowing water; quantity of sewage; precipitation; formulas for estimating storm-water flow; the rational method of estimating storm-water run-off in sewer design; gaging storm-water flow in sewers; sewer pipe; the design of masonry sewers; examples of sewer sections and the loads on sewers; the analysis of masonry arches; street inlets, catch basins, and manholes; junctions, siphons, bridges, and flushing devices; regulators, overflows, outlets, tide gates, and ventilation; and sewage pumping stations.

Volume 2 deals with the construction of sewers, as follows: Preliminary investigations; engineering work and inspection during construction; excavation; machinery for trench excavation; methods of rock excavation; explosives and blasting; quantity and cost of excavation; rate of progress in building sewers; the sheeting and bracing of trenches and tunnels; sizes of sheeting, rangers, and braces; purchasing, handling, and laying sewer pipe; jointing sewer pipe; construction of brick and block sewers; construction of concrete sewers; profiles, templates, forms, and centers; contracts, specifications, and drawings; technical specifications; operation and maintenance of sewerage systems; and explosions in sewers.

The chapters of volume 3, Disposal of Sewage, are as follows: Introduction—progressive steps in sewage treatment; meaning of chemical analyses; bacteria and their relation to the problem of sewage disposal; plankton; composition of sewage; theories of sewage disposal and treatment; sewage disposal by dilution; grit chambers; racks, cages, and screens; sedimentation, straining, and aeration; tanks for sludge digestion; chemical precipitation; sludge; contact beds; trickling filters; intermittent sand filtration; irrigation and the agricultural utilization of sewage and sludge; automatic apparatus for dosing; disinfection of sewage and sewage effluents; and disposal of residential and institutional sewage.

With reference to sewage irrigation and the use of sewage and sludge for fertilization, experience in this country and in Europe is reviewed and it is stated that "the popular opinion of the value of sewage in agriculture is much exaggerated. The fertilizing value of sewage is far less than is commonly supposed, on account of the great dilution of the constituents serviceable to plant life, nitrogen, phosphates, and potash, and, further, because only a part of these substances is present in the sewage in a form suitable for fertilizing pur-

poses. . . . Nitrification is checked if sewage is turned over land in too great quantities or if the air is cold, and if the sewage is applied freely there is a tendency to wash out of the soil what nitrates have formed. In considering the fertilizing value of sewage it is also necessary to consider its ingredients which are detrimental to agriculture. The fat and soap may work harm by clogging the pores of the soil and thus counterbalance the small improvement due to the nitrogen, phosphoric acid, and potash. . . . In sewage disposal . . . the crops should be regarded as merely a by-product. All evidence furnished by many years' experience in many countries under many conditions does not reveal, however, any decisive proof that it is possible to obtain much fertilizing value from city sewage as it must be used to make irrigation practicable, but indicates that where sewage irrigation has been successful agriculturally, irrigation with water would have produced about the same results. English experience indicates that whatever profit is to be made in the future from the fertilizing ingredients of sewage will probably result from the production of artificial manures from sludge."

In a chapter on the disposal of residential and farm sewage, it is stated that "where the desired degree of purification of the sewage is high and the treatment involves methods of filtration which should proceed at fairly regular rates, it is evident that the storage of sewage so as to permit fairly uniform delivery to the filters and some uniformity in the composition of the applied liquid by mixing the laundry wastes, kitchen wastes, and domestic sewage together becomes particularly important. In the second place, the small size of the plants makes it desirable to have them as nearly fool-proof and automatic as possible. Even if the owner's means render economy in management unnecessary, the importance of automatic operation is great because experience shows that regular attendance is rarely given to these little plants."

Septic tanks and absorption systems, T. D. BECKWITH and T. A. H. TEETER (*Oreg. Agr. Col. Ext. Div., Ser. 2, No. 8, pp. 18, figs. 9*).—This publication deals with the design and construction of small sewage disposal systems, consisting essentially of a septic tank and tile absorption area. The designs are based on the views of both the engineer and bacteriologist.

It is pointed out that "the septic tank, if made water-tight, can be located anywhere outside the cellar wall without danger of disease or bad odors. . . . The sewer from the house should consist of a 4- to 6-in. vitrified sewer pipe with a trap near the house end to form a water seal in order to guard against the escape of sewer gas into the house." The necessity of compartments in a septic tank is emphasized, and it is stated that "the scum which forms on the surface of the sewage in the first chamber is essential to the proper action of the tank."

Statements regarding other points of controversy among authorities are made as follows: "The tank becomes nothing more nor less than a large culture chamber for the growth of the proper kinds of bacteria, and upon them solely depends the work of purification of sewage entering the tank. . . . The types of bacteria in a septic tank are two, (1) those which thrive without the presence of free oxygen or air and which demand that the portion of the tank in which they grow must be as nearly air-tight as practicable, and (2) those which require oxygen to thrive and which do their work best in the presence of as much air as possible. The second compartment, where the bacterial action is completed, should be so constructed that air may have free entrance and circulation. . . . A septic tank which purifies over 70 per cent is very exceptional, and generally only from 60 to 65 per cent purification may be expected."

Sewage treatment in small communities where a sewerage system is not available, P. Hansen (*Ill. Health News, n. ser., 1 (1915), No. 11, pp. 179–184, figs. 5*).—This article describes and diagrammatically illustrates a type of common settling tank, a small Emscher double-deck or two-chamber tank, and a tile absorption system for the disposal of residential or farm sewage.

"No part of a subsurface drainage system should be within 200 ft. of any well, assuming an ordinary gravelly or sandy soil. If limestone is near the surface, the danger to wells is infinitely increased. However, the subsurface irrigation system is of far less danger to wells than is the ordinary leaching cesspool. This device is an abomination that should not be permitted in any built-up community, for it is almost impracticable to keep them at a safe distance from shallow wells."

Economy of deep percolating filters, H. W. Clark (*Surveyor, 48 (1915), No. 1245, pp. 540, 541, figs. 2*).—Recent experiments made at the Lawrence, Mass., experiment station on the efficiency of four trickling filters 4, 6, 8, and 10 ft. deep, respectively, are reported, each filter being operated at rates of 500,000, 800,000, 1,000,000, 1,500,000, and 2,500,000 gal. per acre per day. Salt was added to the sewage as an indicator of the filter activity.

With the 1,000,000-gal. flow rate "50 per cent of the sewage applied to the 4-ft. filter reaches the filter outlet mingled with 50 per cent of the held sewage 12 minutes after its application, while with the 10-ft. filter 125 minutes elapse before 50 per cent of the applied salt sewage reached the filter outlet mingled with 50 per cent of the held sewage." With the other rates of flow "the applied and held sewage were about equally intermingled and hence were about equal periods of time in passing through each filter."

These results are taken to indicate the great economy of deep trickling filters as compared with shallow trickling filters.

The oxidation of sewage without the aid of filters, II, E. Ardern and W. T. Lockett (*Jour. Soc. Chem. Indus., 33 (1914), No. 23, pp. 1122–1124*).—A continuation on a larger scale of the experiments previously reported (E. S. R., 32, p. 387), using the continuous flow and fill and draw methods, is reported.

"The effluents obtained throughout this series of experiments were extremely well clarified and in general were superior to those yielded by the best type of bacterial filters. The outstanding feature of these results is the fact that by employing diffused air the necessity for intermediate aeration and consequent manipulation of sludge was entirely removed and at the same time much better effluents were obtained than those yielded by plain pipe aeration when working with a similar aeration period.

The effluents obtained in the earlier laboratory experiments, when working with a six hours' plain pipe aeration period, were liable to absorb an undue proportion of dissolved oxygen. . . . In the series of outdoor experiments . . . the dissolved oxygen absorption of the effluents was remarkably low. This low dissolved oxygen absorption, being coincident with a very low free ammonia content, appears to support the theory previously advanced, that the stage to which nitrification has proceeded is not without influence on the amount of dissolved oxygen absorbed."

The oxidation of sewage without the aid of filters, III, E. Ardern and W. T. Lockett (*Jour. Soc. Chem. Indus., 34 (1915), No. 18, pp. 937–943, figs. 2; Surveyor, 48 (1915), No. 1241, pp. 450–454, figs. 2*).—A third contribution to the subject gives the results obtained to date regarding "(1) the initial production of activated sludge; (2) the volume of air essential for the successful working of the purification process; and (3) the most advantageous proportion of activated sludge to employ; together with a description of certain experiments relating to the purification of a dilute domestic sewage."

The results are taken to indicate "(1) that, apart from the use of slurry from percolating filters, the initial production of activated sludge can be facilitated and obtained with considerably less air cost than originally was the case, (2) that under certain controlled conditions the volume of air required may be considerably less than previously estimated, and (3) that there is an economic advantage in employing an increased volume of activated sludge with special reference to the rate of nitrification." It is concluded "that the estimated costs of aeration indicate that the activated sludge method of sewage purification is eminently a practical process."

Experiments to determine the economic possibilities of sludge from Emscher or Travis tanks, A. V. De Laporte (*Ann. Rpt. Prov. Bd. Health Ontario, 33 (1914), pp. 139–141, fig. 1*).—Experiments are reported, the results of which to date are taken to indicate that "(1) the sludge has practically no value as a fertilizer or a fuel, (2) extraction for the recovery of the grease or distillation with superheated steam would not pay, and (3) destructive distillation designed to recover the grease, gas, ammonia, etc., might cover expenses."

Tables facilitate accuracy in timber beam design, R. C. Hardman (*Engin. Rec., 73 (1916), No. 5, pp. 138, 139*).—The errors in the usual practice of timber beam design based on nominal sizes are pointed out, it being stated that deficiencies in sizes of timbers vary from $\frac{1}{4}$ to $\frac{5}{8}$ in. Factors to be applied to tables of safe loads and a table of actual sizes, sectional areas, and section moduli for commercial lumber surfaced on one side and one edge are given.

Influence of temperature on the strength of concrete, A. B. McDaniel (*Univ. Ill. Engin. Expt. Sta. Bul. 81 (1915), pp. 24, figs. 15; abs. in Engin. and Contract., 44 (1915), No. 21, pp. 405–408, figs. 7*).—Experiments on the influence of temperature on the attainment of strength in concrete are reported. These included three groups of tests, namely, 45 6- by 6-in. cylinders, 51 6-in. cubes, and 60 8- by 16-in. cylinders. The concrete was composed of 1 part cement, 2 parts sand, and 4 parts broken stone, by weight, corresponding to 1 part cement, 2.2 parts sand, and 3.6 parts broken stone, by volume. The test specimens were stored in temperatures varying from 26.5 to 95.6° F. The temperature of storage was determined by daily readings of the maximum and minimum thermometers. The following conclusions are considered justifiable:

"Under uniform temperature conditions, there was an increase of strength with age within the limits of the tests. For any temperature the rate of increase decreases with the age of the specimen, and this rate of increase is less correspondingly at the lower temperature conditions. For the specimens tested, under normal hardening temperature conditions of from 60 to 70°, the compressive strength of the concrete subjected to a uniform temperature at the ages of 7, 14, and 21 days may be taken as approximately 50, 75, and 90 per cent of the strength at 28 days, respectively. For lower temperatures the percentage values are less, and for higher temperatures the percentages are higher. The relation between the percentage values at the ages of 7, 14, 21, and 28 days is nearly the same for temperature conditions from 30 to 70°. However, the values for the lower temperatures should be used with caution. Concrete which is maintained at a temperature of from 60 to 70° will at the age of one week have practically double the strength of the same material which is kept at a temperature of from 32 to 40°."

Curves of the results are also presented for convenient use.

Use of water-gas tar and coal tar on concrete subjected to high velocities of water, C. H. Paul (*Reclam. Rec. [U. S.], 7 (1916), No. 1, p. 46; Engin. and Contract., 45 (1916), No. 3, p. 56*).—The use of water-gas tar and coal tar on the concrete surfaces of the regulating outlets through the Arrowrock dam is

described. These outlets are 4 ft. 4 in. in diameter and are subjected to velocities of 60 ft. per second or higher. The purpose of such surfacing was "not so much that of waterproofing as to fill all the minute voids in the surface of the outlets, so as to prevent, if possible, the erosion caused by the formation of vacuum in small voids or pockets."

The results from one year's service tests are taken to indicate "that the use of this tar coating gave thoroughly satisfactory results."

The use of concrete for protecting wood-stave pipe, K. A. Heron (*West. Engin., 7 (1916), No. 1, pp. 27–29, figs. 4*).—This article describes the remodeling of two partially decayed wood-stave pipe lines in Colorado. Repairs were made by covering the pipe with concrete. Cost data are included.

Methods for the determination of the physical properties of road-building rock, F. H. Jackson, Jr. (*U. S. Dept. Agr. Bul. 347 (1916), pp. 27, figs. 12*).—This bulletin is a partial revision of Office of Public Roads Bulletin 44 (E. S. R., 27, p. 587). It is limited to a description of methods employed by the Office of Public Roads and Rural Engineering for testing rock for road building, and "is intended to serve as a more or less permanent laboratory manual for those who have occasion to make such tests." It deals with the physical properties of road-building rock and physical tests of road materials, including specific gravity, weight per cubic foot, water absorption, Deval abrasion test, hardness test, toughness test, cementing value test, and compression test. Two appendixes deal with the selection and shipment of samples and laboratory equipment.

Proceedings of the thirteenth annual meeting of the Ontario Good Roads Association, 1915 (*Proc. Ontario Good Roads Assoc., 13 (1915), pp. 201, pls. 3*).—These proceedings include the following special papers: Road Construction in New York State, by G. C. Diehl; Wearing Surfaces, by G. W. Tillson; Finance, by S. L. Squire; Road Laws, by B. Michaud; Bridges and Culverts, by L. E. Allen; State Roads of New Jersey, by R. A. Meeker; Road Foundations, by J. Duchastel; Machinery, by F. E. Ellis; Dust Prevention, by W. W. Crosby; Maintenance of Roads, by G. Henry; Road Organization, by G. H. Henry; Road Location, by C. R. Wheelock; Gravel and Stone Roads, by C. Talbot; The Evolution of the Asphalt Pavement in Toronto, by G. Powell; Good Roads and the Contractor, by H. T. Routly; Traffic and Its Relation to Road Construction, Maintenance, and Cost, by W. D. Sohier; Brick Roads and Streets, by E. A. James; Bituminous Construction, by J. Pearson; Concrete Roads and Streets, by H. S. Van Scoyoc; and Creosoted Wood Block Pavements, by A. F. Macallum.

Annual report on highway improvement, Ontario, 1914 (*Ann. Rpt. Highway Imp. Ontario, 1914, pp. 110, figs. 36*).—This report deals with the following subjects related to highway improvement: Expenditure by counties, model and experimental roads, bituminous roads, operation and care of machinery, cost keeping and accounting, bridges and abutments, types of county roads, broken stone roads, gravel roads, drainage, the geology of road building materials, the testing of stone and gravel, culverts, explosives, and asphaltic deposits.

Report of the surveyor general for the year 1914, A. A. Spowers (*Ann. Rpt. Dept. Pub. Lands Queensland, 1914, pp. 84–98, pls. 5*).—The activities and expenditures of the Queensland surveyor general's office for 1914 are reported, together with the reports of district surveyors. These include surveys of lands, roads, etc.

When the boiler needs attention (*Power Farming, 25 (1916), No. 1, pp. 42–44, figs. 5*).—Methods of repairing boilers of steam tractors are described and illustrated.

How to install the farm gasoline engine, G. H. MATHEWSON (*Gas Power, 13 (1916), No. 8, pp. 10, 12, 14, figs. 5*).—Brief hints are given regarding the installation of an engine, special reference being made to the construction of a proper foundation.

Antifreezing solutions for your engine, C. P. SHATTUCK (*Gas Power, 13 (1916), No. 8, pp. 54, 56*).—Ways and means of preventing frozen radiators and cracked cylinders are briefly described, and a table showing the combinations and freezing points of calcium chlorid solutions, alcohol, glycerin, and glycerin and alcohol mixtures is given.

General notes on power farming, E. R. WIGGINS (*Power Farming, 25 (1916), No. 1, pp. 18, 19*).—Data on operating the cream separator, on gas engine operation and efficiency, and on grinding feed with an engine are briefly presented.

Directory and specifications of gasoline and oil farm tractors (*Farm Machinery, No. 1265 (1916), pp. 40–43*).—This is a second directory, said to be complete to date.

The latest idea in tractor harvesting, E. L. WATSON (*Gas Power, 13 (1916), No. 8, pp. 5, 6, fig. 1*).—A means devised and used for operating the binder levers from the engine seat consisted of disconnecting the bundle carrier trip rod and attaching it to a foot lever on the engine frame, transferring the binder shifting lever from the seat pipe and the lever for raising and lowering the reel to the stub tongue within easy reach of the operator.

The daily working capacities of motor plows and formulas for their determination, THALLMAYER (*Mitt. Deut. Landw. Gesell., 30 (1915), No. 52, pp. 791–794*).—The results of different tractor plowing tests are reviewed, with special reference to the relation between brake and drawbar horsepower, depth of plowing, actual hours of work, etc.

The following formula for the determination of daily plowing capacity of tractor plows is proposed: $F=27\ \frac{(\alpha Z)(\beta N)}{tW}$, in which F=area plowed in hectares, Z=gross hours of work, N=brake horsepower of tractor, t=depth of plowing in centimeters, W=soil resistance in kilograms per square decimeter, and α and β are coefficients, the former indicating the relation between gross and net working hours and the latter the relation between brake and drawbar horsepower. The review of test results shows that α averaged about 0.75 and β about 0.52 for gas tractors, about 0.73 for steam tractors, and about 0.64 for motor plows.

The practical value of model tests on the plow, R. BERNSTEIN (*Mitt. Verb. Landw. Masch. Prüfüngsanst., 9 (1915), No. 1, pp. 9–24, figs. 3*).—This is a mathematical and graphical discussion.

Trial of steam thrashers at Lyallpur, W. ROBERTS (*Agr. Jour. India, 10 (1915), No. 3, pp. 285–287, pls. 2*).—A comparison of the work of a 30-in. and a 48-in. thrasher in thrashing wheat is said to indicate the marked superiority of the 48-in. machine.

Using the modern grain separator, G. F. CONNER (*Power Farming, 25 (1916), No. 1, pp. 9, 40, 41, figs. 4*).—This is a brief description of the mechanical details of the grain separator in its present stage of development.

Test of a separator for cold milk of a capacity of 220 liters per hour, A. NACHTWEH (*Mitt. Verb. Landw. Masch. Prüfüngsanst., 9 (1915), No. 1, pp. 32–43, figs. 3*).—A machine for the separation of cream from cold milk is described and diagrammatically illustrated, and tests are reported with milk at temperatures varying from 3 to 15° C. (37.4 to 59° F.).

The main difference between this machine and those for the separation of warm milk is that the cylinder is larger and the size and number of disks

and of inlet and outlet holes are greater. It was found that the separator removed from cold milk all but from 0.12 to 0.18 per cent of the fat and also cleaned the milk. Separation was continued for an hour without obstruction.

List of farm building plans (*Mississippi Agr. Col. Ext. Dept.* [*Circ.*], *1916, pp. 11, fig. 1*).—A list of farm building plans furnished by the agricultural engineering department of the Mississippi College to farmers of Mississippi is given.

Silos, D. Scoates (*Mississippi Agr. Col. Ext. Dept. Circ., pp. 7*).—This circular discusses briefly the essential features of silos, especially the wooden and concrete types.

Refrigeration and its increasing importance for different purposes, W. Ahrens (*Naturwissenschaften, 3* (*1915*), *No. 37, pp. 477–483, figs. 9*).—A discussion is given of the applicability and use of refrigeration for different purposes, together with a description of refrigerating processes and apparatus and their practical operation.

Ice on the farm, W. L. Nelson (*Missouri Bd. Agr. Mo. Bul., 13* (*1915*), *No. 9, pp. 2–19, figs. 9*).—This is a compilation of information regarding ice and farm ice houses, much of which has been drawn from Farmers' Bulletin 623 of this Department (E. S. R., 32, p. 591).

RURAL ECONOMICS.

The settlement of public lands in the United States, B. H. Hibbard (*Internat. Inst. Agr.* [*Rome*], *Internat. Rev. Agr. Econ., 7* (*1916*), *No. 1, pp. 97–117*).—The author treats of the settlement of public lands in the United States beginning with the year 1783.

He states that "one sorry effect of the great liberality of the land policies by which settlement was encouraged, and almost never restrained, was the almost unbelievable rapidity of settlement of the western country. Population and grain production doubled throughout the great grain States in periods of about 20 years, and this at a time in the development when it meant the addition to the farm area of 50,000,000 or 60,000,000 acres of farm land and 6,000,000 or 8,000,000 of people per decade. The result was ruinously low prices and a discouraged and restless farm people. . . .

"At present what is needed is a plan by which the Government may administer the affairs of the land yet in its hands in such a manner as to result in putting it into the hands of people who will use it for production instead of exploitation. Likewise the state governments need land policies both with respect to land which they still possess and land which in private hands is being used with a view to speculative gains to the present owner, resulting in hardship to the man who actually undertakes to turn a portion of it into a farm."

The nature of demand for agricultural products and some important consequences, J. G. Thompson (*Jour. Polit. Econ., 24* (*1916*), *No. 2, pp. 158–182*).—The author has divided commodities into two classes—elastic and inelastic. He considers that the demand for a commodity is elastic when that commodity is of such a nature that the demand is sensitive to price change or to a change in the purchasing power of the prospective buyer. He has placed agricultural products in the inelastic class, and states that with reference to food supplies as a whole it is very evident that the demand is relatively inelastic.

"With reference to any particular article of food in the consumption of which there is no fixed custom or habit there may be a considerable measure of elasticity of demand because of the possibility of the substitution of one article of food for another. But the consumption of one article of food in place

of another can not materially increase or decrease the amount of food consumed as a whole. A larger demand for one article would mean simply a smaller demand for other articles. . . . With reference to the textile fibers and other agricultural raw materials for the manufacture of articles of dress, there is seen to be a considerable degree of elasticity of demand, due to the character of the demand for the finished products. . . .

"In recent years the inelastic character of the demand for the products now raised on the farm has afforded a bar to expansion in the production of those commodities proportional to the improvements introduced in agriculture, and the consequence of the introduction of these improvements—especially improved agricultural machinery—taken in connection with the indisposition of demand for agricultural products to expand beyond a certain limit, has been to transfer workers by the millions from the farm to the urban centers. The city has gathered to itself, not only manufactures, but many other activities for the products of which demand is of the elastic sort. The city has thus become, as compared with the country, the center of expansion in industry and thus in population."

The marketing of farm products, L. D. H. WELD (*New York: The Macmillan Co., 1916, pp. XIV+483, figs. 2*).—The author's thesis is that marketing is a phase of production as defined by the professional economist. He defines production as the creation of utilities, that is, any process that makes a thing more useful, as by molding it into more desirable forms in the factory, by transporting it from one place where it is less needed to another place where it is more needed, or by storing it from one season of the year when it is less needed until another season when it is more needed. He has treated this subject from this point of view under the headings of marketing at country places, methods of sale, functions and organization of wholesale trade, sales by auction, cold storage as a factor in marketing, cost of marketing, transportation as a factor in marketing, prices of farm products, produce exchanges, price quotations, future trading, inspection and grading, city markets and direct marketing by parcel post, cooperative marketing, problems of retailing, and weaknesses, remedies, and governmental activities.

Car-lot distribution, J. S. CRUTCHFIELD (*Fruit and Prod. Marketer, 7 (1916), No. 6, pp. 1, 4, 5*).—The author summarizes his conclusions as follows:

"Car-lot marketing and distribution are accomplished most satisfactorily when the distributing organization, be it composed of growers or middlemen, has the confidence of growers, buyers, retailers, and consumers, as well as bankers and railroads. To justify and retain this confidence and cooperation necessitates an honest and intelligent effort to consider and respect the rights and interest of each."

[Purchase and marketing associations in Posen and West Prussia, their systems of organization and development], Z. NIKLEWSKI (*Landw. Jahrb., 47 (1914), No. 5, pp. 719–787*).—The author points out the occasion and motive for the establishment of the association, the organization of the different unions, the amount of business transacted, and the extent of the organization and membership, and appends a brief bibliography.

Historical sketch of the development of the Central Bureau and Netherlands Agricultural Committee, C. G. J. A. VAN GENDEREN STORT (*Nederland. Landb. Com., No. 2 (1915), pp. 91–184*).—This article describes the first central bureau organized to purchase commercial fertilizers and its development and reorganization. The different laws relating to the Central Bureau and the Netherlands Agricultural Committee are included.

Report on the working of the cooperative credit societies in the district of Ajmer-Merwara, 1913–14 (*Rpt. Work. Coop. Credit Soc. Ajmer-Merwara,*

1913–14, pp. 18+31).—This report shows the number of societies, membership, working capital, interest, rate on loans and deposits, and profit and loss. A brief statement relative to the principal problems arising during the year is included.

Report on the working of the cooperative societies in the Central Provinces and Berar, 1914–15 (*Rpt. Work. Coop. Soc. Cent. Prov. and Berar, 1914–15, pp. 3+12+40*).—This report gives the number of societies by types, their membership, capital, rate of interest, receipts and disbursements, and profit and loss.

Report on the working of the cooperative societies in the Punjab, 1915 (*Rpt. Work. Coop. Soc. Punjab, 1915, pp. 3+3+11, tables 15*).—This report gives the number and types of societies, receipts and disbursements, profit and loss, rate of interest, and a brief review of the progress in the organization and supervision of cooperative societies.

How to finance the farmer: Private enterprise, not state aid, M. T. Herrick and R. Ingalls (*Cleveland: Ohio Com. Rural Credits and Coop., 1915, pp. 58*).—The authors discuss the rural credits movement, early methods of stimulating farm mortgages, building and loan associations, landschafts, bond and mortgage companies, and rural cooperative banking.

In calling attention to the difference between the landschafts and the building and loan associations they claim "that the building and loan association serves both investor and borrower members; it finances itself by their savings, avoids the use of its credit, makes its loans in cash, and is purely cooperative. The landschaft, on the other hand, serves only borrowers; it has no need of savings, deposits, or working funds coming from any source, from either members or non-members, since it operates entirely upon credit and makes its loans in debentures, while it is neither an association nor a company; nor is it cooperative, although it imposes mutual liability on members. In spite of these fundamental differences, however, there are points of resemblance; both are thrift institutions and both are protected by a safeguard which prevents them from being encumbered with obligations to outside parties. . . . Nobody joins the landschaft except applicants for loans, and membership ceases upon repayment of the loan; but liability as a member continues for a statutory period, usually two years, after retirement. . . .

"A marked similarity appears between the methods of accumulating the sinking fund in a landschaft and the capital of a building and loan association. Both come entirely from members through obligatory periodic payments made with the effect, if not in the spirit, of thrift; but there the similarity ends, for a landschaft is the creditor, while the building and loan association is the debtor, of members in respect to its funds, with the landschaft holding exactly a converse position in respect to the outside world."

It is also claimed that the agricultural States should be divided into districts for issuing debentures for loans secured by massed mortgages on farm lands and guarantied by the unlimited, collective liability of the borrowers.

The following legislative steps are considered necessary for the proper organization of rural credit: "An amendment of the National Banking Act so as to permit a national bank that confines its credit facilities to members to be organized as an association of any form without capital stock; An amendment of the banking act of each State so as to permit any kind of bank that confines its credit facilities to members to be organized as an association of any form without capital stock; an enabling and regulatory law by the nation and by each State, legalizing for economic associations whatever is lawful for corporations; a clause in such laws to permit combination among farmers' associations and associational banks, among associations organized for selling

food and household supplies to members, and among associations organized by artisans for buying on their common account the materials needed in their work or for selling their products."

Rural organization, community, county, division, state, H. A. MORGAN and H. K. BRYSON (*Col. Agr. Univ. Tenn., Ext. Div. Pub. 10* (*1915*), *pp. 19, pl. 1, fig. 1*).—The authors believe that there should be organized in the local communities, clubs whose membership have a common interest, and that the local organizations should be federated into county, district, and state institutions. Methods of procedure in the organizing of clubs and a model constitution and by-laws are given.

Country life week, 1915 (*Ohio State Univ. Bul., 20* (*1915*), *No. 6, pp. 70, figs. 22*).—This report contains abstracts of addresses presented at the second country life conference (E. S. R., 33, p. 190), held at the Ohio State University, August 2–6, 1915, including the following: Rural Organization in Ohio, by P. L. Vogt; Church Administration and the Rural Problem, by W. F. Anderson; The Psychology of Religion, by J. H. Snowden; Rural Resources for Church Efficiency, by G. W. Fiske; Progress in a Northwest Ohio Community, by W. E. Grove; Some Country Church Problems in Ohio, by C. M. McConnell; The Place of the Rural Y. M. C. A. Work in Ohio, by T. D. Lanham; Annual Report of the Executive Secretary of the Ohio Rural Life Association, by C. O. Gill; The Grange as a Community Builder, by L. J. Taber; Agricultural Extension, by C. S. Wheeler; The Farm Bureau of County Agent Work, by G. W. Bush; and Causes of Feeble-Mindedness and Treatment of the Feeble-Minded, by E. J. Emerick.

Rural housing, W. G. SAVAGE (*London: T. Fisher Unwin, 1915, pp. X+11–297, pls. 16, figs. 5*).—The author gives briefly the historical development of the housing problem in England and Wales and describes how the housing conditions may be improved. A brief review of the laws relating to rural housing and sanitation is included.

He summarizes his conception of the housing problem as follows:

"Existing cottages are wearing or have worn out; economic causes prevent private enterprise erecting more in anything like sufficient and compensatory numbers; the local authorities will not build if loss is likely to fall upon the rates and the powers to make them are ineffective; the State, through the Local Government Board, exhorts and stimulates, but provides no pecuniary help; the problem is being solved in each place in which it arises by the migration to town or colony of some of the best of the agricultural working classes.

"If the shortage of houses is dealt with, the question of dealing with defective houses presents no great administrative difficulty. The remedy for defective houses is simple—it is more houses. If only there are enough houses the defective houses can be closed or made fit."

Periodic migrations of Irish agricultural laborers, J. HOOPER (*Internat. Inst. Agr. [Rome], Mo. Bul. Econ. and Soc. Intel., 6* (*1915*), *No. 12, pp. 105–114*).—The author points out the source of the migratory laborers, their extent, types, character of work performed, wages, and savings.

Suggestions concerning checking and tabulating farm management survey data (*U. S. Dept. Agr., Office Sec. Farm Manage. Circ. 1* (*1916*), *pp. 40*).—Assuming that the investigator is familiar with the methods of gathering farm management survey data in the field, this pamphlet is intended as a desk manual to aid in using these data. The subject is treated from the following standpoints: Checking the office sheets, preliminary calculations, principles of tabulation, classification of farms by tenure, and suggested tables. There is a brief discussion under each of these headings, together with a number of illustrative examples.

Lumber accounting and opening the books in primary grain elevators, J. R. HUMPHREY and W. H. KERR (*U. S. Dept. Agr., Office Markets and Rural Organ. Doc. 2 (1916), pp. 12*).—This pamphlet describes the forms necessary to supplement the regular grain elevator accounts when the elevator carries on a lumber business as a side issue, and methods of opening and closing the books of grain elevators. Model forms for the lumber accounts are included.

Some extremes in Ohio soils, C. E. THORNE (*Mo. Bul. Ohio Sta., 1 (1916), No. 3, pp. 77–85, figs. 2; Agr. Student, 22 (1916), No. 5, pp. 313–320*).—In this article are given comparative results obtained on the experimental farms in Clermont and Paulding counties by the use of different combinations of fertilizers and crops. Marked differences were observed, and it is concluded that "it would seem, as a business proposition, the Paulding county farm was a better investment at $175 per acre than the Clermont county farm at $50."

Statistics of Ohio farms, F. M. LUTTS (*Mo. Bul. Ohio Sta., 1 (1916), No. 3, pp. 91–95*).—The author has pointed out some of the errors found in the agricultural statistics gathered by the township assessors. The principal difficulties were due to misinterpretation of the questions and carelessness in taking the original record, as well as in tabulation.

Monthly crop report (*U. S. Dept. Agr., Mo. Crop Rpt., 2 (1916), No. 2, pp. 13–20*).—This report gives a summary of farm prices for corresponding months of 1914, 1915, and 1916, the estimated value of important farm products on January 15 and February 1, 1916, with comparisons for earlier years, the range of prices of agricultural products at important markets, a preliminary estimate of the acreage of truck crops in Florida, a revised estimate of the acreage contracted for by canneries of corn, peas, and tomatoes for 1913, 1914, and 1915, brief statements regarding ocean freight rates on wheat, the crops of India for 1915–16, the Census report on beet sugar for 1914, and miscellaneous data. The aggregate crop value for the thirteen principal crops for 1915 is estimated at $5,345,842,000 and for all crops $6,788,905,000.

A summary statement is made relative to the diversification of crops in the South. The wheat acreage in the Southern States increased from 3.7 per cent of the total acreage in 1911 to 7.9 per cent in 1915, the oat crop from 4.3 to 7.1, and the hay crop from 3 to 3.6 per cent.

There is also included a special article by S. A. Jones relative to beans and peas. This contains statistical tables showing the uses to which the crop is put, the usual dates of planting and harvesting, and the acreage of the individual kinds compared with the total acreage of all beans and peas in the various States.

Agricultural statistics of Italy (*Ann. Statis. Ital., 2. ser., 4 (1914), pp. 155–168*).—This report continues data previously noted (E. S. R., 32, p. 491), adding information for 1914.

AGRICULTURAL EDUCATION.

The fighting chance for agriculture, E. B. COLLETT (*Proc. Cent. Assoc. Sci. and Math. Teachers, 14 (1914), pp. 25–28*).—The author endeavors to point out some dangers to agricultural instruction in its effort to gain a place in the educational system. He concludes that while agriculture brings most valuable and practical material to the school, it lacks an organization and richness of content necessary for class-room work; that, in order to render a real service to the educational system, there must be poured into the heart of the course a technique, such as Latin contains, for mental development; that a careful watch must be kept of scientific advancement and at the same time its particular application to the changing needs of agriculture in practice; and that not the course of study but service toward mankind must be made the goal.

"Agriculture, as a school course, had better never be taught if it fosters an aim of specialized competition among men rather than a united effort in directing the forces of nature for the benefit of mankind."

Vocational training and liberal culture, C. C. SCHMIDT (*Proc. N. Dak. Ed. Assoc., 28 (1914), pp. 180–187*).—The author gives the definitions of the term "culture" of a number of leading educational authorities and discusses the cultural value of vocational education, taking agricultural and home economics courses as examples.

Work for the improvement of rural education, C. P. COLEGROVE ET AL. (*Bul. Iowa State Teachers Col., 15 (1915), No. 3, pp. 83, figs. 116*).—This is a report on the work of the Iowa State Teachers College in the improvement of rural education by means of rural demonstration schools; the introduction of agriculture, domestic science, and manual training, which are required subjects in the rural schools of Iowa since July 1, 1915; the organization of community centers; extension work for the improvement of teachers in service, including teacher study centers, county institutes, lectures, and entertainments; and training teachers for rural schools.

Recommendations and regulations for the establishment, organization, and management of agricultural and household science departments in continuation and high schools and collegiate institutes (*Toronto, Canada: Ont. Dept. Ed., 1915, pp. 45*).—The requirements as to accommodations, equipment, qualifications of staffs, and courses of study for the approval of the establishment of an agricultural or household science department, or both, and the distribution of the annual government grant of $150 for each year of the courses in agriculture and household science, respectively, under the industrial education act, are outlined.

It is provided that the school board must appoint an advisory agricultural committee, consisting of four members of the board and four rate payers actually engaged in agricultural pursuits, and that for a beginning an area for experimental plats of 8 or 10 square rods of land within the school grounds or adjoining them may be found sufficient. The courses at present cover only two years but a third year will be added as soon as required. The agricultural subjects include farm mechanics, science, fruit growing, floriculture, landscape and vegetable gardening, beekeeping, poultry husbandry, field crops, animal husbandry, dairying, farm management, rural economics and arithmetic; and the household science subjects include cleaning, cookery, foods, the house, laundering, sewing, marketing, entertaining, household accounts, home nursing, and emergencies, beekeeping, poultry and dairy husbandry, fruit growing, floriculture, landscape and vegetable gardening, entomology, bacteriology, and rural economics. Lists of suggested home projects in agriculture and household science are included. An outline of a seasonal course in the special agricultural subjects and price lists of equipment for the agricultural and household science departments are appended.

The best type of agricultural high school, C. J. N. NELSON (*Proc. N. Dak. Ed. Assoc., 28 (1914), pp. 81–84*).—This discussion is intended to bring out the relative economy and efficiency of the two types of agricultural high schools in the State of North Dakota, viz, the state schools and the county or Gibbens schools.

The state agricultural high school is a city school receiving $2,500 annual state aid for agricultural instruction, the agricultural department of which is under local direction and supervision. The county agricultural school is a separate institution with a separate building, faculty, and administration, under the direction of a county board, and receiving $3,000 annually from the State for maintenance.

The author believes that a maximum of efficiency at a minimum of expense can best be attained when agriculture is put in as a department in a school rather than to make the school exclusive in this line and limiting the work only to prospective farmers. He contends that agriculture should be placed within the reach of all young people, boys or girls, side by side with all other cultural subjects and not segregated from the so-called cultural school. Further, the student in the high school should not begin to specialize except to some extent in agriculture in the higher classes, and should be in a school with broad courses and liberal electives to have full freedom of choice.

The Gibbens schools, W. A. BROYLES (*Proc. N. Dak. Ed. Assoc., 28 (1914), pp. 77–80*).—An account is given of the organization and work of the county agricultural school at Park River, N. Dak., which is one of two such county schools supported jointly by the county and the State under the Gibbens Act of 1911, amended in 1913 (see above).

These schools are free to residents of the county, and teach agriculture, including the study of soils, horticulture, plant life, and animal life, a system of farm accounts, manual training and domestic economy, and the common branches and such other branches as are necessary for the training of teachers in methods of school management and provision for observation and practice in the art of teaching. The schools are a continuation of an ungraded system instead of a graded system and the law does not define or speak of them as high schools.

The advantages of this type of school are summed up as follows: "The county as a unit has more funds than a smaller unit and admits of more systematic extension work than a larger unit. . . . In attacking the question of rural community life in its various phases the county school has the great advantage of a single aim. . . . It has no set of grades to divide the time of the executive. In its rural school work it has the resources of the county superintendent's office with its deputies to share responsibilities and give assistance. It has no assured consistency in the form of a ninth grade coming in regularly with the change of the seasons. This single-mindedness gives it opportunity to concentrate its forces upon certain things—individual instruction and careful classification; an elaborately planned and directed short course, going about the county, learning of it and serving it through schools and families, providing a center for rural life propaganda."

Eighth annual report of the inspector of high schools to the state board of education for the year ending June 30, 1915, R. HEYWARD (*Bismarck, N. Dak.: State Ed. Dept., 1915, pp. 53, figs. 9*).—This report includes, among other material, statistical data on the enrollment, equipment, salaries, etc., of the five state high schools having an agricultural department, and brief reports on the school farm at Carrington, the extension work of the schools, and state aid for agricultural instruction.

It is shown that 43 high schools offered courses in agriculture in the past year and that 8.5 per cent of the pupils enrolled pursued the work. The five schools having an agricultural department report a total value of equipment for agricultural instruction of $2,850, and a total enrollment in agriculture of 133, a gain of 24 over the previous year. The enrollment in agriculture in all of the other state high schools for the year was 307, a gain of 65 over the previous year. Each of the five schools received $2,020 state aid for its agricultural department.

What the instruction at the Royal Agricultural, Horticultural, and Forestry High School is and what it should be, Z. KAMERLING (*Indische Mercuur, 38 (1915), Nos. 28, pp. 565–567; 29, pp. 585–587*).—This is a discussion of the curriculum of the Royal Agricultural, Horticultural, and Forestry High

School at Wageningen, The Netherlands, and suggestions for its improvement, by an instructor who was a former student at this school.

Material and methods for teaching agriculture in the grades below the high school, C. D. LEWIS (*Proc. Ky. Ed. Assoc., 44 (1915), pp. 158–160*).—The author does not consider agricultural instruction so much a new branch to be taught in the elementary schools as a new attitude of mind, a new relation to life, which it is hoped to secure through new ideals and ideas gradually instilled into the lives of children through the medium of the old subjects reorganized around a new center. He discusses the reconstruction of the elementary general school subjects to this end, and recommends that agricultural nature study material be added and that the science of agriculture be left for secondary and higher institutions.

Home projects in secondary courses in agriculture, H. P. BARROWS (*U. S. Dept. Agr. Bul. 346 (1916), pp. 20*).—With the view of making the home farm a more definite factor in agricultural instruction through the home project plan, the author discusses the development of the home project idea and the essentials of a successful project; outlines potato, pig, alfalfa, orchard, poultry, and farm home projects; suggests lists of production, demonstration, improvement, and management projects; and calls attention to some project problems now receiving attention.

Physical geography and soils, R. P. GREEN (*Proc. Ky. Ed. Assoc., 44 (1915), pp. 160, 162–167*).—This is a consideration of the problem of so teaching physical geography as to increase the pupils' knowledge of the soils, especially as to their origin and nature, the destructive work of mechanical erosion and its relation to soil fertility and permanent agriculture, etc.

Home economics instruction, COUNTESS R. DE DIESBACH (*Enseignement menager. Paris: Pierre Tequi [1914], pp. XXXII+127*).—This is a discussion of the need, nature, organization, choice of teacher and her qualifications, and results of home economics instruction in France.

Extension course in vegetable foods, ANNA BARROWS (*U. S. Dept. Agr. Bul. 123 (1916), pp. 78, figs. 4*).—This is a revision of Bulletin 245 of the Office of Experiment Stations, previously noted (E. S. R., 26, p. 597).

Teaching of sewing, RUBY BUCKMAN (*Proc. Ky. Ed. Assoc., 44 (1915), pp. 96–98*).—The author offers suggestions on subject matter and method in teaching sewing, and holds that sewing if properly taught possesses cultural value and numerous other advantages.

Nature-study in the Geneseo schools, Ill., JOSEPHINE BAILEY (*Nature-Study Rev., 11 (1915), No. 9, pp. 418–421*).—The study of insects, animals, birds and flowers, and weeds and trees in grades 3, 4, and 5 of the Geneseo, Ill., schools is described.

Intensive gardening, ELIZABETH P. SHEPPARD (*Nature-Study Rev., 11 (1915) No. 9, pp. 424–428, fig. 1*).—An outline is given of gardening work as conducted in the spring of 1915 at the normal school at Trenton, N. J. Some 200 children of the practice school worked out garden projects, individually or in groups, and about 100 normal school students from the nature study classes assisted in the activities, learning how to plan and conduct this part of nature study.

Boys' and girls' club work for 1916, C. A. NORCROSS (*Agr. Ext., Univ. Nev. Leaflet 1 (1915), pp. 4*).—This circular outlines the organization and procedure for three state-wide boys' and girls' clubs organized in January, 1916, viz, a girls' home economics club and boys' and girls' animal husbandry and gardening clubs. It is proposed to offer 2-year courses in these clubs, those having received an extension certificate for the satisfactory completion of the first-year course being eligible for the second-year advanced work in 1917.

NOTES.

Georgia Station.—B. W. Hunt, of Eatonton, has been appointed to succeed J. W. McWhorter as a member of the board of directors.

Kansas College and Station.—D. E. Lewis, assistant professor of horticulture and asistant in the fruit and vegetable disease investigations, resigned April 1 to engage in commercial fruit growing. P. E. Crabtree, specialist in crops in the extension division, has been appointed district agricultural agent for western Kansas with headquarters at Scott City.

Maine University.—Alexander Lurie, instructor in horticulture, has been appointed horticulturist in the Missouri Botanical Garden.

Cornell University.—The New York State College of Agriculture, in cooperation with various other state agencies, such as the farm bureaus, is conducting an active campaign this spring against oat smut. In this campaign it is using a pictorial poster in bright colors, the poster showing two men in the act of treating smut with formaldehyde solution, while the lettering on the poster gives very briefly the essential features of the treatment. Information on the subject is being sent out systematically to the agricultural press, largely through the farm bureau agents. One of the railroads of the state is running an oat smut demonstration train.

All of these activities are regarded as preliminary to the most important part of the work, which is actual demonstration through meetings with farmers.

Pennsylvania Station.—The station has planned an extensive field test of different carriers of phosphorus. The plan of this experiment calls for 4 tiers of 41 one-tenth acre plats in each, making a total of 164 plats. The crop rotation will consist of corn, oats, wheat, and mixed clover and timothy, each one year, and the fertilizers will not be applied until the plats have passed through one four-year rotation. This will afford preliminary data concerning the relative fertility of the plats.

The experiment is designed to test tne relative efficiency of equal amounts of phosphorus in different carriers when used in connection with a complete fertilizer, with barnyard manure, and with a crop rotation in which the crop residues are returned to the soil. It will also include the effect of lime on the different forms of phosphorus, together with a comparison of the different methods of applying rock phosphate and acid phosphate.

During the past summer preliminary field and pot experiments were conducted with soil of the Dekalb series from the vicinity of Snow Shoe, Center County. This has led to the establishment of a field experiment in somewhat greater detail with a view of determining the effect of manure, lime, and commercial fertilizers for the improvement of the Dakalb soils.

Rhode Island Station.—Frank O. Fitts has resigned as assistant in chemistry to accept a similar position at the New Jersey stations.

Vermont University.—County agents are now at work in 11 of the 14 counties of the State. F. C. Shaw, agricultural instructor in the farm and trades' school at Thompson's Island in Boston Harbor, began work in Bennington County March 27, and F. H. Abbott in Washington County, April 13.

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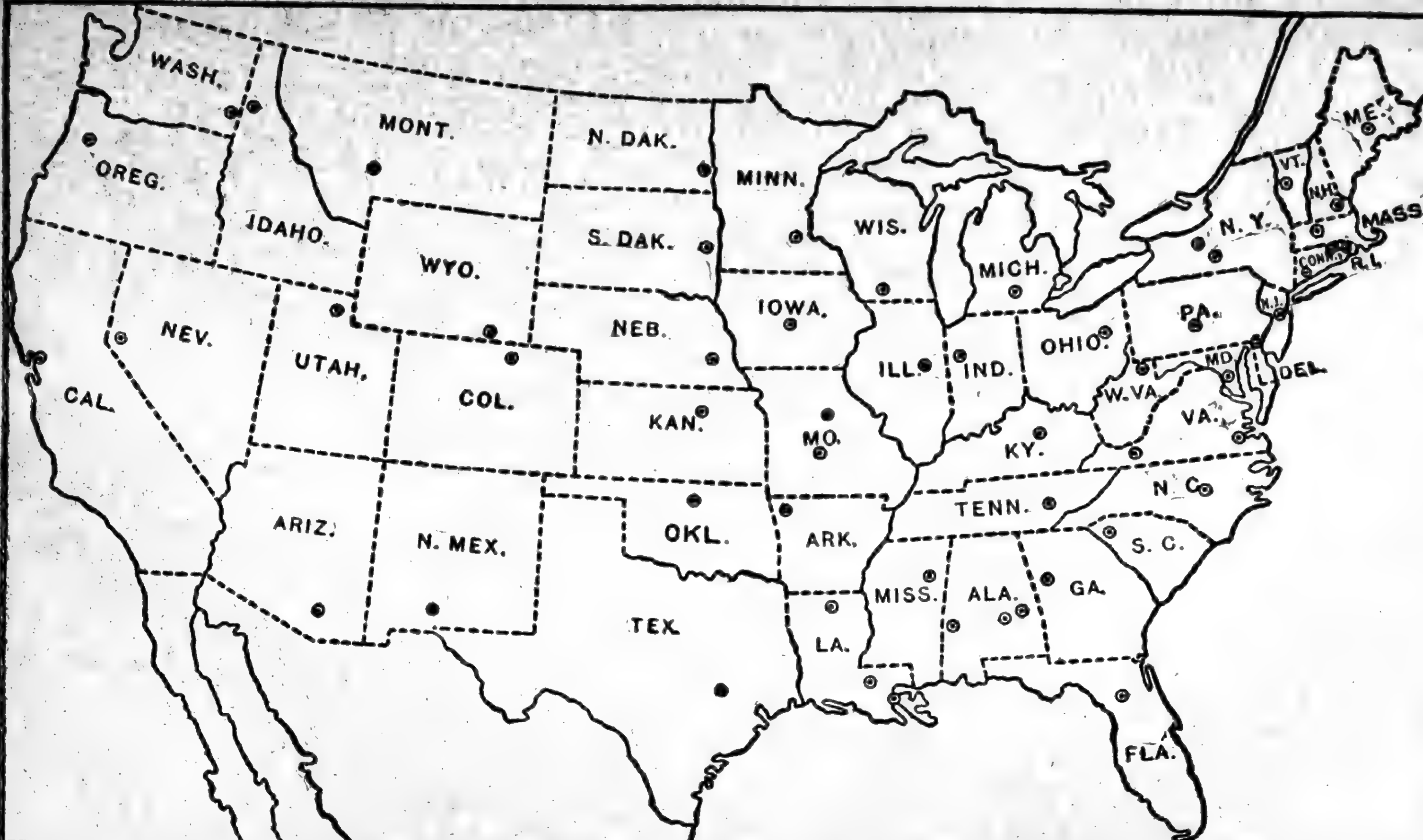

THE AGRICULTURAL EXPERIMENT STATIONS OF THE UNITED STATES.

Issued September 5, 1916.

U. S. DEPARTMENT OF AGRICULTURE

STATES RELATIONS SERVICE

A. C. TRUE, DIRECTOR

Vol. XXXIV INDEX NUMBER

EXPERIMENT STATION RECORD

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1916

U. S. DEPARTMENT OF AGRICULTURE.

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[a] Director. [b] Agronomist in charge. [c] Acting director.

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NOTE.—The abbreviations "Ala. College," "Conn. State," "Mass.," etc., after entries refer to the publications of the respective state experiment stations; "Alaska," "Guam," "Hawaii," and "P. R." to those of the experiment stations in Alaska, Guam, Hawaii, and Porto Rico; "Can." to those of the experiment stations in Canada; and "U.S.D.A." to those of this Department.

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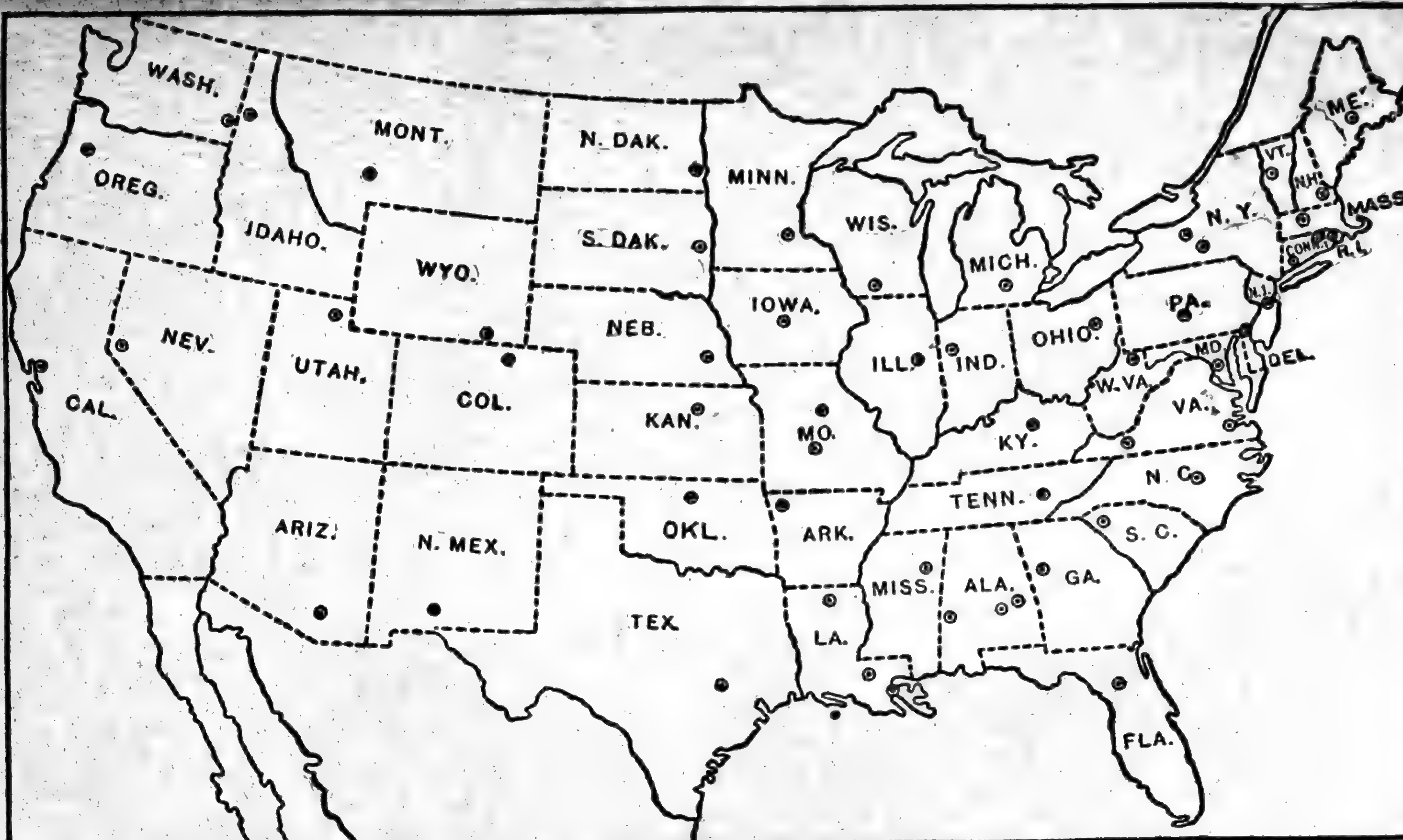

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